

*Final Report*

Rat Oral Subchronic Toxicity Study  
of Normal Butanol

TRL Study #032-006

## SUMMARY

The purpose of the study was to evaluate the toxicity of normal butanol in a rat subchronic toxicity study.

Four groups of male and female rats (30/sex/group) were dosed orally once daily with 0, 30, 125, or 500 mg/kg/day of compound for 6 weeks until the day of the interim necropsy. After the interim sacrifice, all surviving rats were dosed daily until the final sacrifice. Body weights and food consumption were recorded weekly and the rats were observed at least twice daily for mortality and overt signs of toxicity. Ophthalmologic examinations were done during the pretreatment period and again during week 13. Blood and urine for clinicopathologic evaluation were collected from a fifth group of 10 rats/sex prior to initiation of dosing, from all surviving rats scheduled for the interim sacrifice, and from the first 10 rats/sex/group at the final sacrifice. The first 10 male and 10 female rats from each group were scheduled for necropsy on day 43 or 44 and all remaining rats on day 92 or 93. Gross postmortem examinations were done on all rats. Organ weights were taken from rats sacrificed on day 92 or 93. After the final sacrifice, a complete histopathologic examination was done on all rats in the control and high-dose groups, on livers, kidneys, and hearts from the low- and mid-dose groups, and on all gross lesions. In addition, a histopathologic examination was done on any rat found dead or sacrificed in extremis.

The only unequivocal effects produced by normal butanol were ataxia and

hypoactivity at the 500 mg/kg/day dose level. Ataxia and hypoactivity were not seen as treatment-related signs until the final six weeks of the study with maximum weekly incidences of 32% and 29%, respectively. No treatment-related clinical signs were seen at the 30 or the 125 mg/kg/day dose level.

Body weight and food consumption values were similar for control and all treated groups. No treatment-related effect was observed at the ophthalmoscopic examinations or in gross or microscopic evaluation of the tissues.

Three rats were found dead or sacrificed in extremis, but these deaths could not be attributed to the test article, normal butanol.

At the interim clinical pathologic evaluation, red blood cell count (RBC), packed cell volume (PCV), and hemoglobin (HGB) averages of the 500 mg/kg/day dose group females were 5% below control averages. Although these differences were statistically significant, they were small and no differences between the parameters were observed in the males of the interim evaluation or between control and treated groups of either sex at the final evaluation. Therefore, even if the lower red blood cell parameters in the 500 mg/kg/day females were an actual treatment-related effect, it was small and transitory.

#### CONCLUSION

Oral administration of normal butanol at 500 mg/kg/day produced ataxia

and hypoactivity at a maximum weekly incidence rate of 32 and 29%, respectively. A slightly (5%) lower (compared to controls) red blood cell count (RBC), packed cell volume (PCV), and hemoglobin (HGB) concentration present only in the 500 mg/kg/day dose group females at the interim evaluation may have been treatment-related.

No treatment-related effect was observed at the 30 mg/kg/day or 125 mg/kg/day dose levels.

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## I Introduction

The purpose of this study was to evaluate the toxicity of normal butanol in a rat subchronic toxicity study. In order to assess the toxicologic potential after both 6 weeks and 13 weeks of dosing, an interim sacrifice at the 7 week interval was included.<sup>a</sup> The oral route of administration was used because this is the probable route of human exposure.

This study was conducted in accordance with the protocol (Appendix I), the Standard Operating Procedures of Toxicity Research Laboratories (TRL) and in compliance with Good Laboratory Practice Regulations for Nonclinical Laboratory Studies.<sup>b</sup> Procedures pertinent to this study are described herein.

## II Methods

### A. Test Material

Normal butanol (lot # 3597 KVVE) was purchased from American Scientific Products, Romulus, Michigan. Samples of each dose concentration were saved during weeks 1, 4, 6, 10, and 13 and taken to the Muskegon County Wastewater Treatment Facility for chemical analysis under the direction of Dr. Avi Joshi, Physical Chemist. Duplicate samples were sent to Mr. John Maney, ERCO, a division of Enseco, Inc., 185 Alewife Brook Parkway, Cambridge, Massachusetts for referee analysis.

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<sup>a</sup> Protocol Change #4, effective 9/10/85.

<sup>b</sup> Federal Register, Vol. 43, No. 247, Part II, December 22, 1978, pp. 59986-60020.

B. Animals and Husbandry

The rat was chosen as a test system because of its established usefulness in toxicologic studies and as a pharmacologic model. One hundred-fifty three male and one hundred-forty seven female rats<sup>a</sup> (45-55 grams) aged 22-23 days arrived on August 12, 1985 and were housed individually in wire-bottom cages<sup>b</sup>. Filtered municipal water<sup>c</sup> and Purina Certified Rodent Laboratory Chow #5002 (pellet)<sup>d</sup> were available ad libitum. This feed has been tested by the manufacturer for contaminants, none of which were present at levels that would be expected to affect the outcome of the study. An acclimation period of 7 days prior to the pretreatment week was allowed. During the acclimation period, the rats were observed with respect to general health and any rat with evidence of disease or physical abnormality was discarded. A clean/dirty corridor system was in effect. Room air was filtered and humidity (average  $47.6\% \pm 9.2$ ) and temperature (average  $70.2^{\circ}\text{F} \pm 2.2$ ) controlled. The temperature value was calculated using the daily high and low value,  $\pm 1$  standard deviation. One value per day was used to calculate the humidity average. A 12 hour light:12 hour dark cycle was controlled automatically.

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<sup>a</sup> Charles River Breeding Laboratories, Inc., Portage, Michigan, Crl: CD<sup>R</sup>(SD)BR.

<sup>b</sup> Rats were housed in accordance with recommendations contained in DHEW Publication No. 78-23 (NIH): Revised 1978, "Guide for the Care and Use of Laboratory Animals." During the acclimation period the rats were housed 3/cage.

<sup>c</sup> Water used at TRL analyzed periodically for the presence of contaminants as defined by the Environmental Protection Agency "National Interim Primary Drinking Water Regulations" Code of Federal Regulation, Title 40-Protection of Environment Part 141.11 (b) and 141.12. Records retained at TRL.

<sup>d</sup> Lot #s May02-85-3E, Aug01-85-2E, Aug07-85-1B, Aug10-85-2D, Aug21-85-2D. Checkerboard Square, St.Louis, MO 63164.

The first day of the pretreatment week was August 19, 1985. At the initiation of the pretreatment week the rats were assigned randomly to groups (30 rats/sex/group and a fifth group of 10/sex) using a computer printout.<sup>a</sup> The rats were individually identified by toe clipping.

C. Compound Administration

Administration of the test material began on August 26, 1985. The rats scheduled for the interim sacrifice were dosed daily for 42 or 43 days and the rats scheduled for the final sacrifice were dosed daily for 91 or 92 days.

<u>Group</u>	<u>Normal Butanol (mg/kg/day)</u>	<u>Animal Numbers</u>			
		<u>Male</u>	<u>Final</u>	<u>Interim</u>	<u>Female</u>
I	0	001-010	011-030	031-040	041-060
II	30	061-070	071-090	091-100	101-120
III	125	121-130	131-150	151-160	161-180
IV	500	181-190	191-210	211-220	221-240
V	Baseline	241-250		251-260	

The amounts administered were based on the most recent individual weekly body weight values. Fresh solutions of the compound (in deionized water) were prepared weekly and dosed orally at a volume of 10 ml/kg. Controls received deionized water at the same volume. A plastic syringe and an 18 gauge ball-tipped metal dosing cannula ensheathed in a number 8 French catheter were used to administer the solution.

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<sup>a</sup>

Randomization printout programmed by Dr. John Quiring, Associate Professor of Mathematics and Computer Science, Department of Mathematics and Computer Science, Grand Valley State Colleges, Allendale, Michigan.

D. Clinical Observations

Body weights and food consumptions were recorded weekly and the rats were observed at least twice daily for mortality and clinical effects.

E. Ophthalmology

All rats received an ophthalmoscopic examination during the pretreatment period and week 13 by a veterinary ophthalmologist.<sup>a</sup>

Ophthalmologic examinations were conducted on all rats in a darkened room with an indirect ophthalmoscope. Seven rats that had an eye lesion during the pretreatment period were not included in the study.

F. Clinical Pathology

1. Sampling

Blood and urine samples were collected from the 10 male and 10 female rats in group V prior to initiation of dosing. Blood was obtained at the time of necropsy from all surviving rats scheduled for the interim sacrifice and from the first ten rats/sex/group at the final sacrifice. Urine was collected over a period of up to 4 hours in metabolism cages 3-5 days prior to the scheduled sacrifices. The rats were anesthetized with CO<sub>2</sub>, the thoracic cavity was opened and blood was collected by cardiac puncture. A necropsy was then done on each of these rats (except those in group V) and the tissues preserved.

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<sup>a</sup>

Exams performed by W. F. Keller, D.V.M., M.S. and associates, Diplomates, American College of Veterinary Ophthalmologists, Michigan State University, East Lansing, Michigan.

## 2. Tests Performed

The following tests<sup>a</sup> were performed:

Hematology: hemoglobin (HGB), hematocrit (PCV), erythrocyte count (RBC), mean cell volume (MCV), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), total and differential leucocyte counts (WBC), estimated platelet count (PLT).

Serum Chemistry: alkaline phosphatase (Alk phos), blood urea nitrogen (BUN), glutamate pyruvate transaminase (SGPT), glutamate oxalacetate transaminase (SGOT), glucose (Gluc), total protein (TP), albumin (Alb), A/G ratio (calculated), globulin (calculated), total bilirubin (Tot. bili.), sodium (Na), potassium (K), chloride (Cl), calcium (Ca),<sup>b</sup> inorganic phosphate (Phos), carbon dioxide (TCO<sub>2</sub>), total serum cholesterol (Chol), creatinine.

Urinalysis: pH, specific gravity, glucose, protein, ketones, bilirubin, urobilinogen, microscopy of sediment.

## G. Necropsy

A necropsy was performed on all surviving rats of the first 10 males and 10 females from each dose group on day 43 or 44 of the study. On days 92 or 93 the remaining rats were necropsied. Rats found dead were also necropsied. Interim and final sacrifice rats were anesthetized with CO<sub>2</sub> and exsanguinated by cardiac puncture. The cranial, thoracic and peritoneal cavities were opened and the contents examined macroscopically. The organs and tissues listed in section H were removed from each animal and preserved. Lungs were inflated with formalin via the trachea. Eyes with attached optic nerve from all

<sup>a</sup> See Appendix E for clinical pathology methodology.

<sup>b</sup> Protocol Change #1, effective 8/15/85; Protocol Change #2, effective 8/13/85.

<sup>c</sup> Protocol Change #4, effective 9/10/85.

rats killed at the interim and final sacrifices were preserved in a modified Zenker's fixative. The testes with attached epididymides from all male rats were preserved in Bouin's fixative. All other tissues were preserved in 10% neutral-buffered formalin. Feet were preserved with the tissues for positive identification of the rat.

Prior to fixation at the final sacrifice only,<sup>a</sup> the following organs were weighed: brain, heart, liver, spleen, kidneys, testes with epididymides, and ovaries. After fixation, the adrenals and thyroids with parathyroids were weighed.<sup>a</sup> For paired organs, the organ weight was the combined weight of right and left members of the pair. Organ/body weight ratios were determined for each tissue. No organ weights were taken on rats found dead.

#### H. Histology

The full tissue microscopic examination listed below was done on the control and high-dose rats, on one rat sacrificed in extremis, and on those found dead. Also, livers, hearts, and kidneys of low- and mid-dose rats, and all gross lesions seen at necropsy were examined microscopically.

As tissues were trimmed, the presence or absence of tissues and lesions was noted. The tissues were placed in Tissue Tek<sup>®b</sup> cassettes that were labeled with study number, rat number and the cassette

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<sup>a</sup> Protocol Change #4, effective 9/10/85.

<sup>b</sup> Lab Tek Division, Miles Laboratories, Inc., Naperville, IL 60540.

number. They were then processed on a Fisher Scientific Histomatic<sup>®a</sup>, or an AO TP/8000<sup>®b</sup>. After processing, the tissues were embedded in paraffin using a Tissue Tek<sup>®</sup> embedding system. They were sectioned at 5-6 microns, mounted on numbered slides and stained with hematoxylin and eosin.

The following tissues were placed on sequentially numbered slides as follows:

Slide Number	Tissue
1	heart and attached aorta (a longitudinal section)
1	thymus
2	lung (sections from the caudal and left lobes)
2	trachea (a cross-section)
2	esophagus (a cross-section)
3	stomach (a section from the nonglandular esophageal area through the area of the cardiac glands into the area of the fundic glands and another section from the duodenum through the pyloric sphincter into the area of the pyloric glands)
3	salivary glands (sections of the sublingual and mandibular glands)
4	small intestines (a separate cross-section of the duodenum, jejunum and ileum)
4	colon (a cross-section)
5	liver (sections from the left and right lobes)
5	pancreas (a separate section in addition to sections commonly attached to the viscera)
5	spleen (a cross-section)
5	mesenteric lymph node
6	kidney (a cross-section of the right kidney)
6	urinary bladder (an entire cross-section)
7	adrenal ( a section through the cortex and medulla of one adrenal)
7	pituitary
8	eye (with attached optic nerve)
9	thyroids and parathyroids
9	thoracic spinal cord (a cross-section) <sup>c</sup>
10	lumbar spinal cord (a cross-section)

a Fisher Scientific Products, 34401 Industrial Road, Livonia, MI 48150.

b American Optical Scientific Instruments Division, Buffalo, NY 14215.

c Protocol Change #4, effective 9/10/85.

<u>Slide Number</u>	<u>Tissue</u>
10	brain (three sections including frontal cortex and basal ganglia, parietal cortex and thalamus and cerebellum and pons)
11	bone with marrow-femur
12	testis and epididymis (a cross-section of each)
12	ovary
12	uterus (a cross-section of one uterine horn)
12	cervix (a longitudinal section with uterine horns)
13	skin
13	mammary gland <sup>a</sup>
13	skeletal muscle (thigh) <sup>a</sup>
13	sciatic nerve <sup>a</sup>
14, etc.	tissue masses and all other gross lesions

At the histologic examination, some lesions were graded, when necessary, using the following system: 1 = minimal, 2 = slight, 3 = moderate, 4 = severe, and 5 = extreme.

#### I. Statistics

The body weight, food consumption, clinicopathologic, and organ weight data were tested for homogeneity of variance by Bartlett's method (Steel and Torrie, 1980). If the data were found to be homogeneous, differences between control and treatment means were tested for statistical significance by the method of Dunnett (Dunnett, 1964). If the data were found not to be homogeneous, the method of Gill (modified Dunnett's) was employed (Gill, 1977).

#### J. Data Retention

All data including specimens and a copy of this report will be retained at Toxicity Research Laboratories, Ltd., 510 W. Hackley Avenue, Muskegon, Michigan 49444 for at least 5 years. Before any raw data is discarded, the sponsor will be notified to obtain permission.

<sup>a</sup> Protocol Change #1, effective 8/15/85.

### III. Results

#### A. Test Material

The results of the analysis of samples analyzed by the Wastewater Treatment Facility and by ERCO are given in Appendix A. Stability and concentration were found to be acceptable.

#### B. Clinical Signs

The incidence of clinical effects is given in Table 1.

Treatment-related ataxia first appeared in the high-dose group during week 8. Ataxia and hypoactivity occurred infrequently during weeks 9 and 10. These signs increased to a weekly incidence of 32% and 29% for ataxia and hypoactivity, respectively, at week 11 and continued at approximately the same frequency during weeks 12 and 13. Onset of ataxia and hypoactivity was about 2-3 minutes after dosing and duration was less than one hour.

Other clinical signs observed did not appear to be directly related to treatment. Three rats died during the study. Two of these deaths were the result of the rubber catheter slipping off the metal dosing cannula. During week 4, a catheter lodged in the esophagus of a high-dose female and the rat died of apparent asphyxiation before the catheter could be removed. During week 7, a high-dose male swallowed a catheter. It was sacrificed two days later when it became apparent that the situation was adversely affecting the health of the rat. These accidents and the occurrence of hypoactivity, salivation, labored respiration, and/or retching over a 3 day period in another

high-dose rat account for the majority of significant clinical effects observed in the high-dose group throughout the study. A mid-dose male died during week 1. It began exhibiting hypoactivity, emaciation, and labored respiration on day 4 and was found dead on day 6. Histopathologic evaluation of this rat will be discussed later in the report.

Dark urine and rales occurred in a high-dose male during week 8 following a cage related accident. This rat was normal in appearance within three days. During week 7, a 2 cm diameter tissue mass appeared in the left axillary area of one low-dose female and a 3 cm diameter mass appeared in the right axillary area of another low-dose female. Neither mass increased in size and both disappeared before study termination.

C. Body Weight, Weight Change and Food Consumption

The body weight, weight change and food consumption values are given in Table 2.

No treatment-related effect was present on body weight, weight gain, or food consumption. Statistically significant differences between control and treated group mean weight change and food consumption would occur sporadically, but no trend was observed and total body weight averages for control and treated groups were similar throughout the study.

D. Ophthalmology

The results of the ophthalmologic evaluations are given in Appendix D.

An ophthalmoscopic examination was performed prior to initiation of dosing and all animals with ocular abnormalities were identified and discarded. Another ophthalmoscopic examination was performed during week 13. Lesions were seen at incidences according to the following table (numbers indicate eyes with lesions):

	Control	Low-dose	Mid-dose	High-dose
Chorioretinal hypoplasia	1	1	3	3
Total lesions	1	2	4	5

Chorioretinal hypoplasia is commonly seen in rats of this age, and other abnormalities seen were considered to be within normal limits for rats of this age, sex, and strain.

E. Clinical Pathology

Results of the clinicopathologic evaluation are given in Tables 3 through 7. Normal hematology and serum chemistry ranges for rats at TRL can be found in Appendix F.

Only one alteration in clinical pathologic parameters occurred that was suggestive of a treatment-related effect. At the interim sacrifice, RBC ( $p \leq 0.05$ ), PCV ( $p \leq 0.01$ ), and HGB ( $p \leq 0.01$ ) averages in the high-dose females were 5% less than the corresponding control averages. The RBC and PCV ( $p \leq 0.05$ ) averages for the middle-dose females were also slightly (4% and 3%, respectively) below those of the controls. However, RBC, PCV, and HGB averages were similar for control and treated groups of males at the interim evaluation and for control and treated groups of both sexes at the final evaluation.

Other statistically significant differences between control and treated group averages occurred but they were small, occurred in one sex and at one evaluation only, and there was no dose response relationship. Thus, they were not considered to be treatment-related. They were: a lower ( $p \leq 0.05$ ) cholesterol average in the high-dose males at the interim evaluation, a higher ( $p \leq 0.05$ ) absolute neutrophil count in the middle-dose males at the interim evaluation, a higher ( $p \leq 0.05$ ) relative segmented neutrophil count and a lower ( $p \leq 0.05$ ) relative lymphocyte count in the low-dose females at the final evaluation, and higher ( $p \leq 0.05$ ) urine pH values in the low-dose males at the interim and low-dose females at the final evaluations.

At the final evaluation, the percentage of segmented neutrophils in the mid-dose males was higher than controls (not statistically significant). However, it appears that the increase was due mainly to animal #134, found to have lymphadenitis upon microscopic examination of the mandibular lymph node, and therefore not related to treatment. Also at the final evaluation, a high-dose female (#226) had increased SGPT and SGOT levels. No related lesion was found histologically, and other rats in that group did not show similar tendencies. Therefore, it was not considered to be treatment-related.

#### F. Observations at Necropsy

Observations made at necropsy are given in Table 8 and Appendix G.

No treatment-related lesion was observed in gross necropsy at the

interim or final sacrifices or of the rats found dead or sacrificed in extremis. The lesions present were those commonly observed in laboratory rats and they were present in control and treated groups at similar frequency or were one time occurrences. The enlarged uterine horns are related to the stage of the estrus cycle.

Three rats died during the study. No gross lesions were seen in rat # 224. Rat # 202 (which had a catheter in its stomach) had dark areas on the glandular mucosa of the stomach. In rat # 133 (middle-dose), the left lobe of the lung was red and the cranial and middle lobes were shriveled.

#### G. Organ Weights

Relative and absolute group mean organ weight values are given in Table 9.

There was no apparent treatment-related effect on organ weight values. The only statistically significant difference between control and treated group averages was a slightly ( $p < 0.05$ ) higher thyroid weight average in the high-dose males. No dose response relationship was present, as the absolute thyroid weights were similar for all three treated groups of males. Moreover, they were only 14% above the control average. Thyroid weight averages of the treated females were not above those of the controls. Thus, this difference appears to be a chance occurrence rather than a treatment-related effect.

#### H. Histopathology

The results of the histopathologic examination are given in Table 10 and Appendix G. The histoaccountability report is given in Appendix H.

No treatment-related lesion was observed at the histopathologic evaluation. The lesions that were observed were one time occurrences or were present in the control and treated groups at a similar frequency. The diffuse subacute lymphadenitis of the mandibular lymph node was visible grossly as red or enlarged lymph nodes. This is a commonly observed lesion in laboratory rats. The cause of death of the mid-dose rat (#133) that died during the study was determined to be a gavaging accident since a perforated esophagus was found at the histopathologic examination.

#### IV Discussion

At the interim evaluation, RBC, PCV, and HGB averages in the high-dose females were 5% below control averages. The differences were statistically significant but the biological significance is questionable. All three parameters are closely related, so a decrease in the RBC count would be expected to result in a decrease in PCV and HGB values also. Moreover, the observed differences were small and no difference between these parameters was seen in males at the interim evaluation or between control and treated groups of either sex at the final evaluation. Thus, even if the decrease in RBC count (and hence, PCV and HGB) was a true treatment-related effect, it was small and transitory.

One mid-dose and two high-dose rats died during the study, but none of these deaths was due to administration of normal butanol. The two high-dose rats died because the rubber catheter slipped off of the dosing cannula during dosing. In one case (rat # 224), the catheter lodged in the throat and esophagus, thus cutting off air flow into the lungs. The rat died of apparent asphyxiation before the cannula could be removed. No gross or histologic lesion relating to the death of this rat was observed. The second rat (# 202) swallowed the catheter. It was sacrificed two days later, as the health of the rat was adversely affected by the presence of the catheter in its stomach. Gross necropsy revealed dark areas on the glandular mucosa of the stomach. This was seen histologically as focal necrosis.

Shriveled and red lungs were observed at gross necropsy of the middle-dose rat (# 133) that died. Histologic evaluation revealed pleuritis and edema in the lung and a perforated esophagus. Thus, death was the result of esophageal damage at dosing.

#### V Conclusion

Oral administration of normal butanol at 500 mg/kg/day produced ataxia and hypoactivity at a maximum weekly incidence rate of 32% and 29%, respectively. A slightly (5%) lower (compared to controls) red blood cell count (RBC), packed cell volume (PCV), and hemoglobin (HGB) concentration present in the 500 mg/kg/day dose group females at the interim evaluation only may have been treatment-related.

No treatment-related effect was observed at the 30 mg/kg/day or 125 mg/kg/day dose levels.

VI References

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Gill, J.L. (1977). Journal of Dairy Science 60, 444-449.

Steel, R., and Torrie, J.H. (1980). Principles and Procedures of Statistics, A Biometrical Approach 2nd ed., pp. 471-472. McGraw-Hill, New York.

Table 1

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Incidence of Clinical Signs<sup>a</sup>**

TRL Study #032-006

Group	MALES				FEMALES			
	I 0	II 30	III 125	IV 500	I 0	II 30	III 125	IV 500
Dose Level (mg/kg/day)								
Pretreatment								
No signs observed								
Week 1								
Lacrimation	--	--	1/30	--	--	--	--	--
Labored respiration	--	--	1/30	--	--	--	--	--
Hypoactivity	--	--	1/30	--	--	--	--	--
Emaciation	--	--	1/30	--	--	--	--	--
Found dead	--	--	1/30	--	--	--	--	--
Week 2								
No signs observed								
Week 3								
No signs observed								
Week 4								
Found dead	--	--	--	--	--	--	--	1/30
Week 5								
No signs observed								
Week 6								
Salivation	--	--	--	1/30	--	--	--	--
Retching	--	--	--	1/30	--	--	--	--
Labored respiration	--	--	--	1/30	--	--	--	--

<sup>a</sup> Data presented as animals with sign/live animals.

-- Indicates sign not present in given group.

Table 1 (cont'd.)

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Incidence of Clinical Signs<sup>a</sup>**

TRL Study #032-006

Group	MALES				FEMALES			
	I 0	II 30	III 125	IV 500	I 0	II 30	III 125	IV 500
Dose Level (mg/kg/day)								
<u>Week 7<sup>b</sup></u>								
Tissue mass	--	--	--	--	--	2/25	--	--
Salivation	--	--	--	1/25	--	--	--	--
Rales	--	--	--	1/25	--	--	--	--
Labored respiration	--	--	--	2/25	--	--	--	--
Hypoactivity	--	--	--	2/25	--	--	--	--
Moribund sacrifice	--	--	--	1/25	--	--	--	--
<u>Week 8<sup>c</sup></u>								
Tissue mass	--	--	--	--	--	2/20	--	--
Lacrimation	--	--	--	--	--	--	1/20	--
Rales	--	--	--	1/19	--	--	--	--
Dark urine	--	--	--	1/19	--	--	--	--
Ataxia	--	--	--	1/19	--	--	--	--
<u>Week 9</u>								
Tissue mass	--	--	--	--	--	2/20	--	--
Salivation	--	--	--	1/19	--	--	--	--
Hypoactivity	--	--	--	1/19	--	--	--	--
Ataxia	--	--	--	2/19	--	--	--	--

<sup>a</sup> Data presented as animals with sign/live animals.

<sup>b</sup> Five animals/sex/group sacrificed at interim evaluation on day 1 not included in week 7 tabulation.

<sup>c</sup> Decrease in number of live animals reflects rats sacrificed at interim evaluation on day 2 of week 7.

-- Indicates sign not present in given group.

Table 1 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Incidence of Clinical Signs<sup>a</sup>

TRL Study #032-006

Group	MALES				FEMALES			
	I	II	III	IV	I	II	III	IV
Dose Level (mg/kg/day)	0	30	125	500	0	30	125	500
<u>Week 10</u>								
Tissue mass	--	--	--	--	--	2/20	--	--
Salivation	--	--	--	1/19	--	--	--	1/19
Hypoactivity	--	--	--	--	--	--	--	1/19
Ataxia	--	--	--	--	--	--	--	1/19
<u>Week 11</u>								
Tissue mass	--	--	--	--	--	2/20	--	--
Hypoactivity	--	--	--	5/19	--	--	--	5/19
Ataxia	--	--	--	4/19	--	--	--	8/19
<u>Week 12</u>								
Tissue mass	--	--	--	--	--	2/20	--	--
Hypoactivity	--	--	--	4/19	--	--	--	1/19
Ataxia	--	--	--	2/19	--	--	--	2/19
<u>Week 13</u>								
Tissue mass	--	--	--	--	--	1/20	--	--
Hypoactivity	--	--	--	4/19	--	--	--	1/19
Ataxia	--	--	--	7/19	--	--	--	8/19
<u>Week 14<sup>b</sup></u>								
Ataxia	--	--	--	--	--	--	--	2/9

<sup>a</sup> Data presented as animals with sign/live animals.

<sup>b</sup> Includes only signs seen in animals dosed on day 1 (scheduled for sacrifice on day 2).

-- Indicates sign not present in given group.

Table 2

Rat Oral Subchronic Toxicity Study with Normal Butanol  
Group Mean Body Weight, Weight Change, and Food Consumption

TRL Study #032-006

Group Dose Level (mg/kg/day)	MALES				FEMALES			
	I 0	II 30	III 125	IV 500	I 0	II 30	III 125	IV 500
<u>Initial</u> Body Weight (g)	90	91	91	91	86	86	86	85
<u>Pretreatment</u>								
Body Weight	144	147	146	144	128	129	128	126
Weight Change (g)	53	56	55	53	42	43	42	42
Food Consumption (g)	130	141**	143**	138*	126	129	129	122
<u>Week 1</u>								
Body Weight	193	199	198	191	154	157	153	150
Weight Change	49	53	52	48	25	28	26	23
Food Consumption	158	161	163	159	128	134	130	130
<u>Week 2</u>								
Body Weight	245	254	253	240	173	180	173	173
Weight Change	53	54	55	49	20	23	20	24*
Food Consumption	179	181	182	172	135	139	135	136
<u>Week 3</u>								
Body Weight	294	304	305	290	195	203	194	194
Weight Change	49	51	52	50	22	23	21	21
Food Consumption	192	197	200	190	142	148	140	140
<u>Week 4</u>								
Body Weight	337	344	346	328	213	220	212	212
Weight Change	42	40	42	38	18	17	18	18
Food Consumption	207	211	210	201	147	156	146	147
<u>Week 5</u>								
Body Weight	367	378	381	357	226	235	227	226
Weight Change	31	34	34	29	13	15	15	14
Food Consumption	200	208	211*	195	145	153	147	149
<u>Week 6</u>								
Body Weight	392	404	405	379	237	246	239	237
Weight Change	24	26	25	22	11	12	11	12
Food Consumption	209	214	218	201	149	160	160*	160

\* p ≤ 0.05

\*\* p ≤ 0.01

Table 2  
(cont'd.)

Rat Oral Subchronic Toxicity Study with Normal Butanol  
Group Mean Body Weight, Weight Change, and Food Consumption

TRL Study #032-006

Group Dose Level (mg/kg/day)	MALES				FEMALES			
	I 0	II 30	III 125	IV 500	I 0	II 30	III 125	IV 500
<u>Week 7</u>								
Body Weight (g)	412	428	428	397	251	255	253	246
Weight Change (g)	21	23	20	21	10	9	12	8
Food Consumption (g)	204	207	208	195	147	151	153	150
<u>Week 8</u>								
Body Weight	432	447	449	413	261	267	262	255
Weight Change	20	19	21	16	10	13	9	10
Food Consumption	204	212	220	202	153	167	164	161
<u>Week 9</u>								
Body Weight	447	459	465	431	270	275	267	262
Weight Change	14	12	17	18	9	8	5*	7
Food Consumption	197	198	208	196	152	156	152	153
<u>Week 10</u>								
Body Weight	464	475	482	448	276	284	275	271
Weight Change	17	15	16	17	6	8	8	9
Food Consumption	215	212	222	214	159	173	167	164
<u>Week 11</u>								
Body Weight	474	485	492	459	284	289	280	275
Weight Change	10	10	10	11	8	5	5	5
Food Consumption	200	200	202	196	154	159	149	147
<u>Week 12</u>								
Body Weight	495	506	509	477	293	298	290	285
Weight Change	21	21	17	17	9	9	10	10
Food Consumption	229	231	219	219	174	165	168	171
<u>Week 13</u>								
Body Weight	499	514	514	484	294	304	294	287
Weight Change	5	8	5	7	1	6*	4	2
Food Consumption	196	200	195	194	143	154	151	147

\* p ≤ 0.05

\*\* p ≤ 0.01

Table 3

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary

TRL Study #032-006

MALES

Day of Test -3

	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
--	--------------------------------	----------	-------------	--------------------------------	-----------	-----------	--------------

Group V

Mean	5.56	38.7	12.8	19.1	69.3	23.1	33.2
S.D.	0.35	2.07	0.65	2.64	1.9	0.72	0.46

FEMALES

	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
--	--------------------------------	----------	-------------	--------------------------------	-----------	-----------	--------------

Group V

Mean	5.24	34.8	11.9	11.7	67.1	22.8	34.4
S.D.	0.29	1.74	0.63	2.85	1.7	0.76	1.68

Table 3 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary - Differential

TRL Study #032-006

MALES

Day of Test -3

	ABS. WBC $\times 10^3/\text{ul}$	ABS. NEUT. $\times 10^3/\text{ul}$	ABS. LYMPH. $\times 10^3/\text{ul}$	ABS. MONO. $\times 10^3/\text{ul}$	ABS. EO. $\times 10^3/\text{ul}$	ABS. BASO. $\times 10^3/\text{ul}$	ABS. PLT $\times 10^3/\text{ul}$
--	--	--	---	--	--	--	--

Group V

Mean	19.1	2.0	15.8	1.3	0.1	0.0	adequate
S.D.	2.64	0.98	1.97	0.72	0.13	0.00	

FEMALES

	ABS. WBC $\times 10^3/\text{ul}$	ABS. NEUT. $\times 10^3/\text{ul}$	ABS. LYMPH. $\times 10^3/\text{ul}$	ABS. MONO. $\times 10^3/\text{ul}$	ABS. EO. $\times 10^3/\text{ul}$	ABS. BASO. $\times 10^3/\text{ul}$	ABS. PLT $\times 10^3/\text{ul}$
--	--	--	---	--	--	--	--

Group V

Mean	11.7	1.6	9.5	0.6	0.1	0.0	adequate
S.D.	2.85	0.67	2.50	0.31	0.08	0.00	

Table 3 (cont'd.)

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## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Hematology Summary - Differential

TRL Study #032-006

MALES

Day of Test -3

	NEUT	NEUT						
	WBC	NON	SEG	SEG	LYMPH	MONO	EO	BASO
	$\times 10^3/\text{ul}$	%	%	%	%	%	%	%
Group V								
Mean	19.1	0.0	9.9	83.1	6.7	0.3	0.0	
S.D.	2.64	0.00	4.01	4.91	4.06	0.67	0.00	

## FEMALES

	NEUT	NEUT						
	WBC	NON	SEG	SEG	LYMPH	MONO	EO	BASO
	$\times 10^3/\text{ul}$	%	%	%	%	%	%	%
Group V								
Mean	11.7	0.0	13.5	80.5	5.4	0.6	0.0	
S.D.	2.85	0.00	4.14	5.23	3.20	0.70	0.00	

Table 3 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary

TRL Study #032-006

MALES

Day of Test 43

	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
--	--------------------------------	----------	-------------	--------------------------------	-----------	-----------	--------------

Group I

Mean	7.92	46.6	15.8	11.9	58.6	19.9	33.8
S.D.	0.29	2.13	0.59	2.64	1.8	0.56	0.89

Group II

Mean	7.48	44.2	15.2	12.2	59.1	20.3	34.3
S.D.	0.36	2.24	0.72	2.13	1.6	0.70	0.64

Group III

Mean	7.92	46.1	15.7	14.1	59.0	19.9	34.1
S.D.	0.59	2.77	0.93	4.15	1.2	0.94	0.39

Group IV

Mean	7.85	45.5	15.5	11.0	58.0	19.7	33.9
S.D.	0.45	1.20	0.51	3.02	2.1	0.90	0.48

FEMALES

	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
--	--------------------------------	----------	-------------	--------------------------------	-----------	-----------	--------------

Group I

Mean	7.73	44.8	15.7	8.8	58.0	20.4	35.1
S.D.	0.22	0.94	0.31	2.09	1.3	0.73	0.82

Group II

Mean	7.76	44.9	15.6	8.9	57.9	20.2	34.8
S.D.	0.41	1.49	0.58	2.36	1.6	0.67	0.56

Group III

Mean	7.41	43.3*	15.2	8.5	58.4	20.5	35.1
S.D.	0.17	1.04	0.48	2.42	1.2	0.61	0.61

Group IV

Mean	7.33*	42.7**	14.9**	8.8	57.9	20.3	34.8
S.D.	0.35	1.57	0.70	3.07	1.3	0.38	0.73

\* P less than or equal to 0.05

\*\* P less than or equal to 0.01

Table 3 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary - Differential

TRL Study #032-006		MALES				Day of Test 43		
		WBC $\times 10^3/\text{ul}$	NEUT. $\times 10^3/\text{ul}$	LYMPH. $\times 10^3/\text{ul}$	MONO. $\times 10^3/\text{ul}$	EO. $\times 10^3/\text{ul}$	BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
Group I								
Mean	11.9	0.9	10.1	0.8	0.1	0.0	737.2	
S.D.	2.64	0.30	2.30	0.45	0.10	0.00	132.67	
Group II								
Mean	12.2	1.1	10.3	0.8	0.1	0.0	821.3	
S.D.	2.13	0.50	1.85	0.47	0.09	0.00	157.24	
Group III								
Mean	14.1	1.3*	11.9	0.8	0.1	0.0	908.5	
S.D.	4.15	0.45	4.14	0.41	0.07	0.00	204.79	
Group IV								
Mean	11.0	0.8	9.5	0.6	0.1	0.0	814.5	
S.D.	3.02	0.33	2.69	0.59	0.11	0.00	141.45	
FEMALES								
		WBC $\times 10^3/\text{ul}$	NEUT. $\times 10^3/\text{ul}$	LYMPH. $\times 10^3/\text{ul}$	MONO. $\times 10^3/\text{ul}$	EO. $\times 10^3/\text{ul}$	BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
Group I								
Mean	8.8	0.6	7.6	0.5	0.1	0.0	969.6	
S.D.	2.09	0.25	1.79	0.36	0.11	0.00	224.35	
Group II								
Mean	8.9	0.7	7.7	0.4	0.1	0.0	863.9	
S.D.	2.36	0.25	2.19	0.12	0.15	0.00	118.36	
Group III								
Mean	8.5	0.9	7.2	0.4	0.1	0.0	863.6	
S.D.	2.42	0.43	2.14	0.26	0.05	0.00	227.27	
Group IV								
Mean	8.8	0.8	7.5	0.5	0.1	0.0	854.2	
S.D.	3.07	0.33	2.93	0.20	0.10	0.00	129.58	

\* P less than or equal to 0.05

Table 3 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary - Differential

TRL Study #032-006

MALES

Day of Test 43

	NEUT		NEUT		MONO	EO	BASO
	WBC x10 <sup>3</sup> /ul	NON %	SEG %	LYMPH %			
<b>Group I</b>							
Mean	11.9	0.0	7.6	84.8	7.0	0.6	0.0
S.D.	2.64	0.00	2.55	3.33	3.33	0.70	0.00
<b>Group II</b>							
Mean	12.2	0.0	8.5	84.4	5.9	1.2	0.0
S.D.	2.13	0.00	3.54	5.08	3.54	0.92	0.00
<b>Group III</b>							
Mean	14.1	0.0	10.1	83.3	6.1	0.5	0.0
S.D.	4.15	0.00	3.81	4.69	2.64	0.53	0.00
<b>Group IV</b>							
Mean	11.0	0.0	7.6	86.7	5.1	0.6	0.0
S.D.	3.02	0.00	3.13	2.67	3.84	0.84	0.00

FEMALES

	NEUT		NEUT		MONO	EO	BASO
	WBC x10 <sup>3</sup> /ul	NON %	SEG %	LYMPH %			
<b>Group I</b>							
Mean	8.8	0.0	7.3	86.3	5.1	1.2	0.0
S.D.	2.09	0.00	2.55	3.28	3.59	1.48	0.00
<b>Group II</b>							
Mean	8.9	0.0	8.4	85.9	4.6	1.1	0.0
S.D.	2.36	0.00	3.24	3.59	1.67	1.45	0.00
<b>Group III</b>							
Mean	8.5	0.0	10.3	84.9	4.3	0.5	0.0
S.D.	2.42	0.00	4.76	5.82	2.45	0.53	0.00
<b>Group IV</b>							
Mean	8.8	0.0	9.1	84.1	5.7	1.1	0.0
S.D.	3.07	0.00	4.04	6.98	2.11	1.79	0.00

Table 3 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary

TRL Study #032-006

MALES

Day of Test 92

	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
--	--------------------------------	----------	-------------	--------------------------------	-----------	-----------	--------------

Group I

Mean	7.93	44.8	14.9	9.6	56.5	18.9	33.3
S.D.	0.56	2.73	0.69	2.69	2.3	0.95	0.70

Group II

Mean	7.89	43.5	14.7	11.5	55.1	18.6	33.7
S.D.	0.30	1.67	0.63	3.08	1.9	0.82	0.80

Group III

Mean	7.84	44.0	14.6	11.0	55.8	18.7	33.3
S.D.	0.66	3.61	1.10	1.91	0.8	0.47	0.65

Group IV

Mean	7.74	43.3	14.4	9.5	55.8	18.7	33.4
S.D.	0.43	2.27	0.60	2.64	1.2	0.72	0.90

FEMALES

	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
--	--------------------------------	----------	-------------	--------------------------------	-----------	-----------	--------------

Group I

Mean	7.68	44.2	15.0	7.9	57.4	19.6	34.0
S.D.	0.51	2.91	0.91	2.09	1.9	0.74	0.66

Group II

Mean	7.70	43.4	14.8	7.9	56.3	19.3	34.1
S.D.	0.58	2.88	0.89	3.52	1.2	0.51	0.40

Group III

Mean	7.48	42.5	14.6	6.4	56.8	19.5	34.3
S.D.	0.35	2.00	0.69	1.04	1.2	0.41	0.49

Group IV

Mean	7.75	43.8	14.9	7.3	56.4	19.2	34.0
S.D.	0.43	2.26	0.52	1.83	2.0	0.76	0.77

Table 3 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary - Differential

TRL Study #032-006		MALES					Day of Test	92
		WBC $\times 10^3/\text{ul}$	NEUT. $\times 10^3/\text{ul}$	LYMPH. $\times 10^3/\text{ul}$	MONO. $\times 10^3/\text{ul}$	EO. $\times 10^3/\text{ul}$	BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
<b>Group I</b>								
Mean		9.6	0.8	8.3	0.4	0.1	0.0	720.8
S.D.		2.69	0.33	2.60	0.29	0.05	0.00	145.04
<b>Group II</b>								
Mean		11.5	1.2	9.6	0.7	0.1	0.0	772.6
S.D.		3.08	0.82	2.57	0.34	0.11	0.00	141.56
<b>Group III</b>								
Mean		11.0	1.6	8.6	0.6	0.1	0.0	805.6
S.D.		1.91	1.34	1.71	0.16	0.16	0.00	192.95
<b>Group IV</b>								
Mean		9.5	1.1	7.9	0.5	0.1	0.0	720.0
S.D.		2.64	0.47	2.69	0.30	0.10	0.00	103.33
 <b>FEMALES</b>								
		WBC $\times 10^3/\text{ul}$	NEUT. $\times 10^3/\text{ul}$	LYMPH. $\times 10^3/\text{ul}$	MONO. $\times 10^3/\text{ul}$	EO. $\times 10^3/\text{ul}$	BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
<b>Group I</b>								
Mean		7.9	0.4	7.0	0.4	0.0	0.0	734.9
S.D.		2.09	0.24	1.96	0.21	0.05	0.00	134.02
<b>Group II</b>								
Mean		7.9	0.9	6.4	0.5	0.1	0.0	787.8
S.D.		3.52	0.72	2.50	0.48	0.05	0.00	156.04
<b>Group III</b>								
Mean		6.4	0.6	5.6	0.3	0.1	0.0	716.2
S.D.		1.04	0.32	0.92	0.13	0.07	0.00	141.09
<b>Group IV</b>								
Mean		7.3	0.6	6.4	0.3	0.0	0.0	749.4
S.D.		1.83	0.38	1.88	0.18	0.05	0.00	150.96

Table 3 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Summary - Differential

TRL Study #032-006

MALES

Day of Test 92

	NEUT		NEUT		LYMPH	MONO	EO	BASO
	WBC x10 <sup>3</sup> /ul	NON %	SEG %	SEG %				
<b>Group I</b>								
Mean	9.6	0.0	8.6	86.1	4.8	0.5	0.0	
S.D.	2.69	0.00	3.66	5.09	3.33	0.53	0.00	
<b>Group II</b>								
Mean	11.5	0.0	9.6	83.7	5.7	1.0	0.0	
S.D.	3.08	0.00	5.30	6.70	2.63	1.05	0.00	
<b>Group III</b>								
Mean	11.0	0.0	14.6	79.2	5.3	0.9	0.0	
S.D.	1.91	0.00	9.79	9.99	1.95	1.29	0.00	
<b>Group IV</b>								
Mean	9.5	0.0	11.9	81.7	5.6	0.8	0.0	
S.D.	2.64	0.00	5.32	8.19	4.20	0.92	0.00	

FEMALES

	NEUT		NEUT		LYMPH	MONO	EO	BASO
	WBC x10 <sup>3</sup> /ul	NON %	SEG %	SEG %				
<b>Group I</b>								
Mean	7.9	0.0	5.6	89.3	4.6	0.5	0.0	
S.D.	2.09	0.00	4.20	5.76	2.27	0.71	0.00	
<b>Group II</b>								
Mean	7.9	0.0	11.2*	81.7*	6.4	0.7	0.0	
S.D.	3.52	0.00	4.85	6.43	3.66	0.67	0.00	
<b>Group III</b>								
Mean	6.4	0.0	8.5	86.8	3.8	0.9	0.0	
S.D.	1.04	0.00	4.17	5.43	2.04	0.88	0.00	
<b>Group IV</b>								
Mean	7.3	0.0	7.6	87.1	4.9	0.4	0.0	
S.D.	1.83	0.00	4.40	5.99	3.28	0.70	0.00	

\* P less than or equal to 0.05

Table 4

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Summary

TRL Study #032-006 MALES Day of Test -3

			ALK				
	GLUC	BUN	PHOS	TP	ALB	GLOB	A/G
	mg/dl	mg/dl	U/l	g/dl	g/dl	g/dl	
Group V							
Mean	227.10	18.41	334.62	5.52	3.26	2.26	1.45
S.D.	35.41	2.39	46.36	0.21	0.12	0.13	0.09

FEMALES

			ALK				
	GLUC	BUN	PHOS	TP	ALB	GLOB	A/G
	mg/dl	mg/dl	U/l	g/dl	g/dl	g/dl	
Group V							
Mean	198.66	16.03	244.01	5.84	3.38	2.46	1.38
S.D.	13.52	1.15	44.51	0.30	0.18	0.17	0.09

Table 4 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Summary

TRL Study #032-006

MALES

Day of Test -3

Na	K	Cl	TCO	CHOL	BILI	Ca	TOTL	PHOS	SGOT	SGPT
meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl	U/l	U/l	U/l
<b>Group V</b>										
Mean	144.7	7.19	102.6	31.8	82.4	0.33	12.54	11.91	65.5	42.0
S.D.	0.90	0.41	1.58	1.34	9.86	0.07	0.63	0.80	4.60	2.65

FEMALES

Na	K	Cl	TCO	CHOL	BILI	Ca	TOTL	PHOS	SGOT	SGPT
meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl	U/l	U/l	U/l
<b>Group V</b>										
Mean	145.9	7.05	102.3	31.5	94.6	0.35	12.90	11.71	57.8	40.4
S.D.	1.74	0.38	1.70	1.13	12.77	0.07	0.85	0.70	5.69	5.08

Table 4 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Summary

TRL Study #032-006

MALES

Day of Test 43

	GLUC	BUN	A/G	TP	ALB	ALK PHOS	SGOT	SGPT	GLOB	CREAT
	mg/dl	mg/dl		g/dl	g/dl	U/l	U/l	U/l	g/dl	mg/dl
<b>Group I</b>										
Mean	275.0	18.8	1.08	6.85	3.54	171.5	52.3	33.5	3.31	0.63
S.D.	50.27	2.11	0.10	0.45	0.18	44.57	8.20	7.29	0.34	0.05
<b>Group II</b>										
Mean	284.4	18.7	1.03	6.82	3.46	161.0	46.3	29.3	3.36	0.68
S.D.	49.09	2.70	0.06	0.34	0.17	35.88	4.65	5.41	0.22	0.08
<b>Group III</b>										
Mean	262.7	18.6	1.06	6.86	3.53	171.1	52.4	33.6	3.33	0.65
S.D.	42.43	2.28	0.06	0.22	0.07	41.73	6.86	3.82	0.20	0.05
<b>Group IV</b>										
Mean	262.4	18.8	1.08	6.58	3.41	134.4	49.0	33.1	3.17	0.66
S.D.	55.91	2.72	0.08	0.26	0.07	23.52	6.15	4.59	0.23	0.05

FEMALES

	GLUC	BUN	A/G	TP	ALB	ALK PHOS	SGOT	SGPT	GLOB	CREAT
	mg/dl	mg/dl		g/dl	g/dl	U/l	U/l	U/l	g/dl	mg/dl
<b>Group I</b>										
Mean	244.9	19.8	1.09	7.08	3.69	129.2	50.5	37.1	3.39	0.67
S.D.	70.00	3.12	0.07	0.48	0.19	32.90	4.61	8.68	0.32	0.07
<b>Group II</b>										
Mean	238.6	18.7	1.12	7.13	3.75	118.5	52.4	32.2	3.38	0.64
S.D.	34.82	3.19	0.05	0.42	0.18	30.26	8.23	4.33	0.26	0.05
<b>Group III</b>										
Mean	243.1	17.0	1.11	7.29	3.83	109.0	50.3	34.1	3.46	0.64
S.D.	47.44	3.91	0.06	0.46	0.24	29.80	9.71	5.06	0.26	0.05
<b>Group IV</b>										
Mean	243.0	19.6	1.13	7.12	3.77	119.2	52.6	34.5	3.35	0.69
S.D.	52.17	4.42	0.07	0.49	0.30	45.90	7.62	8.31	0.23	0.09

Table 4 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Summary

TRL Study #032-006

MALES

Day of Test 43

	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
<b>Group I</b>								
Mean	148.1	8.03	100.8	35.4	13.65	10.56	82.9	0.32
S.D.	0.88	1.86	2.57	2.14	0.84	1.97	17.58	0.09
<b>Group II</b>								
Mean	147.4	7.58	100.8	34.9	13.47	9.80	77.6	0.29
S.D.	0.85	1.14	1.32	2.92	0.86	1.04	11.26	0.05
<b>Group III</b>								
Mean	148.5	7.29	101.1	35.9	13.40	9.66	75.3	0.29
S.D.	1.63	1.22	1.79	2.84	0.72	1.25	15.58	0.05
<b>Group IV</b>								
Mean	148.2	7.11	101.0	35.0	13.03	9.81	67.1*	0.25
S.D.	0.83	1.14	2.26	2.87	0.51	0.99	11.56	0.07

FEMALES

	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
<b>Group I</b>								
Mean	146.3	7.91	103.0	32.6	12.83	8.96	78.4	0.29
S.D.	1.86	1.46	1.15	2.34	0.67	1.98	10.34	0.09
<b>Group II</b>								
Mean	145.7	7.90	102.2	33.5	12.84	8.59	78.6	0.28
S.D.	1.07	0.67	1.99	1.91	0.48	1.40	15.66	0.07
<b>Group III</b>								
Mean	147.0	6.67	101.4	34.8	12.86	8.15	82.0	0.26
S.D.	1.49	1.25	2.17	2.73	0.35	1.33	13.29	0.07
<b>Group IV</b>								
Mean	146.9	7.11	102.8	33.8	12.88	8.88	75.8	0.26
S.D.	1.52	1.71	1.55	2.91	0.73	2.05	9.27	0.06

\* P less than or equal to 0.05

Table 4 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Summary

TRL Study #032-006

MALES

Day of Test 92

	GLUC	BUN	A/G	TP	ALB	PHOS	ALK	SGOT	SGPT	GLOB	CREAT
	mg/dl	mg/dl		g/dl	g/dl	u/l	u/l	u/l	u/l	g/dl	mg/dl

Group I

Mean	313.2	19.1	1.01	7.24	3.63	119.2	49.8	34.2	3.61	0.74
S.D.	38.78	2.31	0.06	0.28	0.14	42.99	7.32	4.74	0.20	0.08

Group II

Mean	282.9	18.9	0.99	7.13	3.55	112.0	48.8	35.2	3.58	0.71
S.D.	60.05	2.11	0.05	0.29	0.11	28.37	11.07	11.40	0.22	0.06

Group III

Mean	286.6	17.8	0.97	7.16	3.51	92.8	50.2	35.8	3.65	0.68
S.D.	56.84	1.92	0.11	0.43	0.21	31.73	6.91	7.18	0.37	0.06

Group IV

Mean	290.0	18.8	1.01	7.12	3.56	116.0	53.0	39.0	3.55	0.70
S.D.	69.61	1.93	0.08	0.48	0.28	36.38	10.56	9.32	0.28	0.08

FEMALES

	GLUC	BUN	A/G	TP	ALB	PHOS	ALK	SGOT	SGPT	GLOB	CREAT
	mg/dl	mg/dl		g/dl	g/dl	u/l	u/l	u/l	u/l	g/dl	mg/dl

Group I

Mean	260.5	17.5	1.13	7.76	4.11	71.8	58.7	46.0	3.65	0.73
S.D.	87.72	3.84	0.08	0.65	0.34	34.25	19.81	22.77	0.36	0.09

Group II

Mean	283.2	18.2	1.04	8.00	4.06	83.2	61.0	47.1	3.93	0.75
S.D.	50.66	3.55	0.12	0.46	0.30	23.31	25.76	28.34	0.37	0.14

Group III

Mean	272.8	17.8	1.06	7.62	3.92	92.3	61.2	43.1	3.70	0.71
S.D.	29.20	2.98	0.05	0.24	0.18	27.24	11.54	11.57	0.13	0.07

Group IV

Mean	270.6	17.3	1.10	7.77	4.06	72.9	78.6	44.9	3.72	0.74
S.D.	33.22	1.93	0.06	0.74	0.38	36.76	94.59	40.29	0.38	0.07

Table 4 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Summary

TRL Study #032-006		MALES				Day of Test		92	
		Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
		meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
<b>Group I</b>									
Mean		147.4	7.97	100.4	35.3	13.27	8.74	96.1	0.25
S.D.		1.33	1.29	2.27	2.68	0.70	1.62	18.96	0.08
<b>Group II</b>									
Mean		147.3	7.90	99.5	37.3	13.33	9.36	89.4	0.23
S.D.		1.63	1.78	2.01	2.16	0.76	1.39	9.41	0.04
<b>Group III</b>									
Mean		147.6	7.47	100.0	35.6	13.02	8.19	92.1	0.20
S.D.		1.71	0.87	1.41	1.71	0.51	1.26	16.98	0.06
<b>Group IV</b>									
Mean		147.7	7.51	100.2	36.8	12.81	8.32	93.2	0.20
S.D.		0.86	1.02	1.32	2.00	0.67	1.29	18.95	0.06
FEMALES									
		Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
		meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
<b>Group I</b>									
Mean		145.9	8.20	100.1	32.3	13.41	8.87	104.6	0.21
S.D.		1.40	1.06	2.23	4.45	0.69	2.93	15.17	0.05
<b>Group II</b>									
Mean		146.1	7.52	100.0	34.2	13.19	7.28	98.8	0.19
S.D.		1.56	0.89	1.49	3.00	0.41	1.02	12.41	0.03
<b>Group III</b>									
Mean		146.5	7.40	101.2	33.3	13.06	7.44	100.0	0.19
S.D.		1.74	0.90	1.32	3.24	0.58	1.32	16.96	0.05
<b>Group IV</b>									
Mean		146.2	7.51	100.8	33.6	13.44	7.90	98.7	0.18
S.D.		0.92	1.06	2.15	3.16	0.78	1.88	24.95	0.05

Table 5

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

MALES

Day of Test -3

ANIMAL NUMBER	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
Group V		Baseline					
241	6.17	41.4	13.7	19.7	67	22.2	33.1
242	5.91	40.5	13.4	22.5	68	22.7	33.1
243	5.18	37.0	12.5	21.6	71	24.1	33.8
244	5.41	37.2	12.1	14.6	68	22.4	32.5
245	5.27	37.1	12.4	20.5	70	23.5	33.4
246	5.23	37.1	12.1	21.9	70	23.1	32.6
247	5.72	37.7	12.6	17.2	66	22.0	33.4
248	5.25	37.2	12.5	18.0	71	23.8	33.6
249	5.91	42.5	13.9	16.0	72	23.5	32.7
250	5.57	39.0	13.1	19.3	70	23.5	33.6
Mean	5.56	38.7	12.8	19.1	69.3	23.1	33.2
S.D.	0.35	2.07	0.65	2.64	1.9	0.72	0.46

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

FEMALES

Day of Test -3

ANIMAL

NUMBER

$\times 10^6/\text{ul}$

PCV

HGB

WBC

MCV

MCH

MCHC

g/dl

$\times 10^3/\text{ul}$

fL

pg

g/dl

Group V

Baseline

251	5.26	33.7	11.4	10.6	63	21.7	33.8
252	5.21	35.0	11.7	8.8	67	22.5	33.4
253	5.16	34.9	11.7	12.2	67	22.7	33.5
254	5.77	38.8	12.9	10.6	67	22.4	33.2
255	5.00	34.4	11.8	16.3	69	23.6	34.3
256	5.36	35.3	11.8	8.9	66	22.0	33.4
257	5.14	35.8	12.5	11.2	69	24.3	34.9
258	5.13	34.3	11.7	9.8	67	22.8	34.1
259	5.58	33.2	12.9	11.7	68	23.1	38.9
260	4.74	32.4	11.0	17.1	68	23.2	34.0
Mean	5.24	34.8	11.9	11.7	67.1	22.8	34.4
S.D.	0.29	1.74	0.63	2.85	1.7	0.76	1.68

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006		MALES					Day of Test	-3		
ANIMAL NUMBER		WBC $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	NEUT. $\times 10^3/\text{ul}$	LYMPH. $\times 10^3/\text{ul}$	MONO. $\times 10^3/\text{ul}$	EO. $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
<b>Group V</b>										
241		19.7	2.2	16.7	0.8	0.0	0.0	0.0	0.0	adequate
242		22.5	3.4	18.0	1.1	0.0	0.0	0.0	0.0	adequate
243		21.6	2.2	18.6	0.4	0.4	0.0	0.0	0.0	adequate
244		14.6	0.7	13.4	0.4	0.0	0.0	0.0	0.0	adequate
245		20.5	2.7	16.2	1.6	0.0	0.0	0.0	0.0	adequate
246		21.9	3.3	16.9	1.5	0.2	0.0	0.0	0.0	adequate
247		17.2	1.0	13.8	2.4	0.0	0.0	0.0	0.0	adequate
248		18.0	1.4	14.2	2.3	0.0	0.0	0.0	0.0	adequate
249		16.0	1.9	13.4	0.6	0.0	0.0	0.0	0.0	adequate
250		19.3	0.8	17.2	1.4	0.0	0.0	0.0	0.0	adequate
Mean		19.1	2.0	15.8	1.3	0.1	0.0	0.0	0.0	
S.D.		2.64	0.98	1.97	0.72	0.13	0.00	0.0	0.0	

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

FEMALES

Day of Test -3

ANIMAL NUMBER	WBC $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$				
		NEUT.	LYMPH.	MONO.	EO.	BASO.	

Group V Baseline

251	10.6	1.6	8.7	0.1	0.2	0.0	adequate
252	8.8	0.8	7.3	0.6	0.1	0.0	adequate
253	12.2	1.5	9.9	0.9	0.0	0.0	adequate
254	10.6	0.8	9.1	0.5	0.1	0.0	adequate
255	16.3	1.6	13.7	0.8	0.2	0.0	adequate
256	8.9	1.9	6.0	1.1	0.0	0.0	adequate
257	11.2	1.5	9.3	0.4	0.0	0.0	adequate
258	9.8	1.4	7.9	0.5	0.0	0.0	adequate
259	11.7	1.6	9.1	0.8	0.1	0.0	adequate
260	17.1	3.2	13.7	0.2	0.0	0.0	adequate
Mean	11.7	1.6	9.5	0.6	0.1	0.0	
S.D.	2.85	0.67	2.50	0.31	0.08	0.00	

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006 MALES Day of Test -3

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT NON SEG %	NEUT SEG %	LYMPH %	MONO %	EO %	BASO %	COMMENT
241	19.7	0	11	85	4	0	0	Slight polychromasia, 2 NR <sup>b</sup>
242	22.5	0	15	80	5	0	0	200 cell differential,
243	21.6	0	10	86	2	2	0	200 cell differential
244	14.6	0	5	92	3	0	0	
245	20.5	0	13	79	8	0	0	200 cell differential, <sup>b</sup>
246	21.9	0	15	77	7	1	0	200 cell differential
247	17.2	0	6	80	14	0	0	
248	18.0	0	8	79	13	0	0	
249	16.0	0	12	84	4	0	0	
250	19.3	0	4	89	7	0	0	Rare Howell Jolly Body, 1 N
Mean	19.1	0.0	9.9	83.1	6.7	0.3	0.0	
S.D.	2.64	0.00	4.01	4.91	4.06	0.67	0.00	

<sup>a</sup> NRBC = Nucleated Red Blood Cell

<sup>b</sup> continued:

#242 - Rare Howell Jolly Body

#245 - Rare Howell Jolly Body, 1 NRBC

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006                    FEMALES                    Day of Test -3

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT %	NEUT %	LYMPH %	MONO %	EO %	BASO %	COMMENT
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Group V                    Baseline

251	10.6	0	15	82	1	2	0	Slight polychromasia, <sup>a</sup>
252	8.8	0	9	83	7	1	0	
253	12.2	0	12	81	7	0	0	
254	10.6	0	8	86	5	1	0	
255	16.3	0	10	84	5	1	0	2 NRBC <sup>b</sup>
256	8.9	0	21	67	12	0	0	
257	11.2	0	13	83	4	0	0	Rare Howell Jolly Body
258	9.8	0	14	81	5	0	0	Rare Howell Jolly Body, 1 N
259	11.7	0	14	78	7	1	0	Rare Howell Jolly Body
260	17.1	0	19	80	1	0	0	
Mean	11.7	0.0	13.5	80.5	5.4	0.6	0.0	
S.D.	2.85	0.00	4.14	5.23	3.20	0.70	0.00	

<sup>a</sup> continued:

#251 - slight hypochromia, occasional Howell Jolly Body

<sup>b</sup> NRBC = Nucleated Red Blood Cell

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

MALES

Day of Test 43

ANIMAL

NUMBER

$\times 10^6/\text{ul}$

PCV

HGB

WBC

$\times 10^3/\text{ul}$

MCH

MCHC

%

g/dl

fl

pg

g/dl

Group I

0 mg/kg/day

1	8.05	45.4	15.6	8.0	56	19.4	34.4
2	8.03	45.1	15.5	14.9	56	19.3	34.4
3	8.31	49.5	15.9	15.4	59	19.1	32.1
4	7.50	45.2	15.2	11.1	60	20.3	33.6
5	7.77	45.0	15.4	9.5	58	19.8	34.2
6	7.89	46.4	16.3	15.7	59	20.7	35.1
7	8.39	51.0	17.2	10.5	61	20.5	33.7
8	7.95	47.3	15.5	12.5	59	19.5	32.8
9	7.76	44.6	15.4	10.4	57	19.8	34.5
10	7.59	46.2	15.5	10.9	61	20.4	33.5
Mean	7.92	46.6	15.8	11.9	58.6	19.9	33.8
S.D.	0.29	2.13	0.59	2.64	1.8	0.56	0.89

Group II

30 mg/kg/day

61	7.29	43.0	14.8	13.8	59	20.3	34.4
62	7.10	41.8	14.4	10.3	59	20.3	34.4
63	7.44	43.8	15.6	12.4	59	21.0	35.6
64	7.18	43.0	14.7	10.9	60	20.5	34.2
65	8.16	48.5	16.3	15.1	59	20.0	33.6
66	7.61	43.6	14.9	15.1	57	19.6	34.2
67	7.74	46.2	15.4	8.5	60	19.9	33.3
68	6.94	42.3	14.6	10.7	61	21.0	34.5
69	7.66	42.8	14.6	12.4	56	19.1	34.1
70	7.66	47.0	16.4	12.7	61	21.4	34.9
Mean	7.48	44.2	15.2	12.2	59.1	20.3	34.3
S.D.	0.36	2.24	0.72	2.13	1.6	0.70	0.64

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

MALES

Day of Test 43

ANIMAL

NUMBER	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
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Group III 125 mg/kg/day

121	7.19	43.3	14.8	14.2	60	20.6	34.2
122	7.44	44.7	15.3	24.2	60	20.6	34.2
123	7.21	43.0	14.3	13.4	60	19.8	33.3
124	8.24	48.7	16.5	13.3	59	20.0	33.9
125	8.86	44.9	15.4	14.7	57	17.4	34.3
126	8.00	46.3	15.9	10.3	58	19.9	34.3
127	7.50	43.8	15.2	14.6	58	20.3	34.7
128	7.92	45.8	15.8	9.7	58	19.9	34.5
129	8.71	51.2	17.3	16.3	59	19.9	33.8
130	8.14	49.3	16.8	10.5	61	20.6	34.1
Mean	7.92	46.1	15.7	14.1	59.0	19.9	34.1
S.D.	0.59	2.77	0.93	4.15	1.2	0.94	0.39

Group IV 500 mg/kg/day

181	8.42	46.3	16.1	7.9	56	19.1	34.4
182	7.83	43.9	14.6	8.7	56	18.6	33.3
183	8.77	47.3	15.9	10.7	54	18.1	33.6
184	7.94	46.5	15.7	9.5	58	19.8	33.8
185	7.41	44.9	15.0	9.2	60	20.2	33.4
186	7.42	44.1	15.3	10.5	59	20.6	34.7
187	7.77	46.0	15.8	16.2	59	20.3	34.3
188	7.77	45.1	15.1	8.0	58	19.4	33.5
189	7.78	46.7	16.0	15.3	60	20.6	34.3
190	7.34	44.3	15.1	13.6	60	20.6	34.1
Mean	7.85	45.5	15.5	11.0	58.0	19.7	33.9
S.D.	0.45	1.20	0.51	3.02	2.1	0.90	0.48

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
<b>Group I      0 mg/kg/day</b>							
31	7.89	46.4	16.1	5.8	59	20.4	34.7
32	7.90	44.3	15.2	10.5	56	19.2	34.3
33	7.97	46.1	15.8	8.9	58	19.8	34.3
34 <sup>a</sup>							
35	7.93	44.5	15.8	8.3	56	19.9	35.5
36	7.68	44.3	15.4	8.4	58	20.1	34.8
37	7.61	44.0	16.2	6.0	58	21.3	36.8
38	7.78	45.4	15.7	9.5	58	20.2	34.6
39	7.34	43.8	15.6	8.9	60	21.3	35.6
40	7.49	44.4	15.8	12.6	59	21.1	35.6
Mean	7.73	44.8	15.7	8.8	58.0	20.4	35.1
S.D.	0.22	0.94	0.31	2.09	1.3	0.73	0.82
<b>Group II      30 mg/kg/day</b>							
91	7.36	43.5	15.1	8.0	59	20.5	34.7
92	7.38	44.3	15.4	14.9	60	20.9	34.8
93	7.94	44.6	15.5	7.0	56	19.5	34.8
94	7.48	44.1	15.1	8.6	59	20.2	34.2
95	8.60	48.5	16.7	9.2	56	19.4	34.4
96	7.57	45.0	16.2	8.7	59	21.4	36.0
97	7.54	44.3	15.1	8.0	59	20.0	34.1
98	8.17	45.9	16.1	8.8	56	19.7	35.1
99 <sup>a</sup>							
100	7.77	44.2	15.4	7.1	57	19.8	34.8
Mean	7.76	44.9	15.6	8.9	57.9	20.2	34.8
S.D.	0.41	1.49	0.58	2.36	1.6	0.67	0.56

<sup>a</sup> clotted specimen

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL

NUMBER	RBC $\times 10^6/\text{ul}$	PCV	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
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Group III 125 mg/kg/day

151	7.43	44.4	15.5	12.2	60	20.9	34.9
152	7.25	43.3	15.6	6.5	60	21.5	36.0
153	7.29	43.4	15.1	5.2	59	20.7	34.8
154	7.50	44.4	15.9	11.0	59	21.2	35.8
155	7.41	43.7	15.3	10.9	59	20.6	35.0
156	7.47	42.6	14.6	9.0	57	19.5	34.3
157	7.27	42.4	15.0	9.6	58	20.6	35.4
158	7.34	41.7	14.8	5.5	57	20.2	35.5
159	7.28	42.5	14.5	7.7	58	19.9	34.1
160	7.81	44.9	15.7	7.6	57	20.1	35.0
Mean	7.41	43.3*	15.2	8.5	58.4	20.5	35.1
S.D.	0.17	1.04	0.48	2.42	1.2	0.61	0.61

Group IV 500 mg/kg/day

211	7.74	44.7	15.8	6.5	58	20.4	35.3
212	7.42	43.5	15.0	8.9	58	20.2	34.5
213	7.75	44.3	15.5	15.1	57	20.0	35.0
214	7.59	42.7	15.3	8.5	56	20.2	35.8
215	6.65	40.6	13.6	12.4	61	20.5	33.5
216	7.05	41.4	14.9	6.6	58	21.1	36.0
217	7.04	40.1	13.8	9.6	57	19.6	34.4
218	7.28	42.6	14.7	4.3	58	20.2	34.5
219	7.31	43.1	14.9	7.8	58	20.4	34.6
220	7.51	44.1	15.3	8.5	58	20.4	34.7
Mean	7.33*	42.7**	14.9**	8.8	57.9	20.3	34.8
S.D.	0.35	1.57	0.70	3.07	1.3	0.38	0.73

\* P less than or equal to 0.05

\*\* P less than or equal to 0.01

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

MALES

Day of Test 43

ANIMAL NUMBER	WBC $\times 10^3/\text{ul}$	ABS. NEUT. $\times 10^3/\text{ul}$	ABS. LYMPH. $\times 10^3/\text{ul}$	ABS. MONO. $\times 10^3/\text{ul}$	ABS. EO. $\times 10^3/\text{ul}$	ABS. BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
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Group I 0 mg/kg/day

1	8.0	0.7	6.6	0.6	0.0	0.0	698
2	14.9	0.7	12.5	1.3	0.3	0.0	638
3	15.4	1.1	13.2	1.1	0.0	0.0	726
4	11.1	0.6	9.3	1.2	0.0	0.0	595
5	9.5	0.9	8.5	0.2	0.0	0.0	875
6	15.7	0.9	13.3	1.3	0.2	0.0	650
7	10.5	1.3	8.1	1.1	0.1	0.0	994
8	12.5	1.4	11.0	0.1	0.0	0.0	864
9	10.4	0.7	9.0	0.5	0.1	0.0	729
10	10.9	0.5	9.3	1.0	0.1	0.0	603
Mean	11.9	0.9	10.1	0.8	0.1	0.0	737.2
S.D.	2.64	0.30	2.30	0.45	0.10	0.00	132.67

Group II 30 mg/kg/day

61	13.8	0.7	12.3	0.7	0.1	0.0	837
62	10.3	1.1	8.3	0.6	0.2	0.0	838
63	12.4	1.9	9.5	0.7	0.2	0.0	942
64	10.9	0.8	9.2	0.9	0.1	0.0	1081
65	15.1	0.8	13.0	1.4	0.0	0.0	626
66	15.1	1.8	12.7	0.5	0.2	0.0	648
67	8.5	0.6	7.7	0.1	0.1	0.0	997
68	10.7	0.4	9.7	0.2	0.3	0.0	673
69	12.4	1.1	9.5	1.6	0.1	0.0	695
70	12.7	1.3	10.7	0.8	0.0	0.0	876
Mean	12.2	1.1	10.3	0.8	0.1	0.0	821.3
S.D.	2.13	0.50	1.85	0.47	0.09	0.00	157.24

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006		MALES					Day of Test 43
ANIMAL NUMBER		ABS. $\times 10^3/\mu\text{l}$					
121	14.2	2.1	11.2	0.7	0.1	0.0	774
122	24.2	0.7	22.3	1.2	0.0	0.0	667
123	13.4	1.7	11.5	0.1	0.0	0.0	1151
124	13.3	1.2	11.3	0.7	0.1	0.0	1083
125	14.7	1.6	11.8	1.2	0.1	0.0	1106
126	10.3	0.7	8.8	0.8	0.0	0.0	726
127	14.6	1.6	11.4	1.6	0.0	0.0	877
128	9.7	1.4	7.6	0.7	0.1	0.0	1193
129	16.3	1.0	14.3	0.8	0.2	0.0	824
130	10.5	1.3	8.6	0.6	0.0	0.0	684
Mean	14.1	1.3*	11.9	0.8	0.1	0.0	908.5
S.D.	4.15	0.45	4.14	0.41	0.07	0.00	204.79
Group IV 500 mg/kg/day							
181	7.9	0.9	6.6	0.4	0.1	0.0	682
182	8.7	0.7	7.1	0.9	0.0	0.0	786
183	10.7	1.2	9.3	0.2	0.0	0.0	946
184	9.5	0.6	8.4	0.6	0.0	0.0	941
185	9.2	0.7	8.1	0.2	0.2	0.0	665
186	10.5	1.2	9.2	0.1	0.0	0.0	759
187	16.2	0.2	13.8	2.1	0.2	0.0	1073
188	8.0	0.6	7.0	0.4	0.0	0.0	902
189	15.3	1.2	13.3	0.8	0.0	0.0	686
190	13.6	0.7	12.4	0.3	0.3	0.0	705
Mean	11.0	0.8	9.5	0.6	0.1	0.0	814.5
S.D.	3.02	0.33	2.69	0.59	0.11	0.00	141.45

\* P less than or equal to 0.05

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	WBC $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$				
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Group I 0 mg/kg/day

31	5.8	0.6	5.0	0.0	0.2	0.0	1434
32	10.5	0.6	9.7	0.2	0.0	0.0	723
33	8.9	0.4	7.5	0.8	0.2	0.0	1145
34 <sup>a</sup>							
35	8.3	0.8	6.8	0.7	0.0	0.0	679
36	8.4	0.3	7.4	0.7	0.0	0.0	891
37	6.0	0.5	5.4	0.0	0.1	0.0	981
38	9.5	0.4	8.3	0.6	0.3	0.0	918
39	8.9	0.8	7.6	0.4	0.1	0.0	947
40	12.6	1.1	10.5	1.0	0.0	0.0	1008
Mean	8.8	0.6	7.6	0.5	0.1	0.0	969.6
S.D.	2.09	0.25	1.79	0.36	0.11	0.00	224.35

Group II 30 mg/kg/day

91	8.0	0.7	7.1	0.2	0.0	0.0	993
92	14.9	1.0	13.1	0.6	0.1	0.0	853
93	7.0	0.9	5.6	0.5	0.0	0.0	1008
94	8.6	1.0	7.1	0.4	0.1	0.0	759
95	9.2	0.6	8.0	0.3	0.3	0.0	725
96	8.7	0.6	7.7	0.4	0.0	0.0	875
97	8.0	0.8	6.7	0.5	0.0	0.0	1019
98	8.8	0.2	8.0	0.3	0.4	0.0	733
99 <sup>b</sup>							
100	7.1	0.6	6.0	0.4	0.1	0.0	810
Mean	8.9	0.7	7.7	0.4	0.1	0.0	863.9
S.D.	2.36	0.25	2.19	0.12	0.15	0.00	118.36

<sup>a</sup> broken tube

<sup>b</sup> clotted specimen

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	WBC $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$				
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Group III 125 mg/kg/day

151	12.2	1.3	10.1	0.6	0.1	0.0	711
152	6.5	0.9	5.4	0.1	0.1	0.0	868
153	5.2	0.3	4.7	0.2	0.0	0.0	735
154	11.0	0.4	9.9	0.7	0.0	0.0	635
155	10.9	1.4	8.7	0.7	0.1	0.0	714
156	9.0	1.1	7.8	0.1	0.0	0.0	1036
157	9.6	0.2	9.1	0.2	0.1	0.0	784
158	5.5	0.8	4.6	0.1	0.0	0.0	1037
159	7.7	1.2	5.9	0.6	0.1	0.0	735
160	7.6	1.0	6.1	0.5	0.0	0.0	1381
Mean	8.5	0.9	7.2	0.4	0.1	0.0	863.6
S.D.	2.42	0.43	2.14	0.26	0.05	0.00	227.27

Group IV 500 mg/kg/day

211	6.5	0.5	5.8	0.3	0.0	0.0	825
212	8.9	1.0	7.3	0.5	0.1	0.0	753
213	15.1	1.5	12.7	0.8	0.2	0.0	770
214	8.5	0.5	7.5	0.5	0.0	0.0	901
215	12.4	0.4	11.9	0.1	0.0	0.0	653
216	6.6	0.8	5.3	0.5	0.1	0.0	1090
217	9.6	0.5	8.5	0.6	0.0	0.0	740
218	4.3	0.7	3.0	0.3	0.3	0.0	920
219	7.8	0.7	6.3	0.7	0.1	0.0	925
220	8.5	0.9	7.0	0.5	0.1	0.0	965
Mean	8.8	0.8	7.5	0.5	0.1	0.0	854.2
S.D.	3.07	0.33	2.93	0.20	0.10	0.00	129.58

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

MALES

Day of Test 43

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT		NEUT		MONO	EO	BASO	COMMENT
		NON SEG	SEG	LYMPH	%				

Group I 0 mg/kg/day

1	8.0	0	9	83	8	0	0	
2	14.9	0	5	84	9	2	0	
3	15.4	0	7	86	7	0	0	
4	11.1	0	5	84	11	0	0	
5	9.5	0	9	89	2	0	0	
6	15.7	0	6	85	8	1	0	
7	10.5	0	12	77	10	1	0	
8	12.5	0	11	88	1	0	0	
9	10.4	0	7	87	5	1	0	
10	10.9	0	5	85	9	1	0	
Mean	11.9	0.0	7.6	84.8	7.0	0.6	0.0	
S.D.	2.64	0.00	2.55	3.33	3.33	0.70	0.00	

Group II 30 mg/kg/day

61	13.8	0	5	89	5	1	0	
62	10.3	0	11	81	6	2	0	
63	12.4	0	15	77	6	2	0	
64	10.9	0	7	84	8	1	0	
65	15.1	0	5	86	9	0	0	
66	15.1	0	12	84	3	1	0	
67	8.5	0	7	91	1	1	0	
68	10.7	0	4	91	2	3	0	
69	12.4	0	9	77	13	1	0	
70	12.7	0	10	84	6	0	0	
Mean	12.2	0.0	8.5	84.4	5.9	1.2	0.0	
S.D.	2.13	0.00	3.54	5.08	3.54	0.92	0.00	

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

MALES

Day of Test 43

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT %	NEUT %	LYMPH %	MONO %	EO %	BASO %	COMMENT
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Group III 125 mg/kg/day

121	14.2	0	15	79	5	1	0	
122	24.2	0	3	92	5	0	0	200 cell differential
123	13.4	0	13	86	1	0	0	
124	13.3	0	9	85	5	1	0	
125	14.7	0	11	80	8	1	0	
126	10.3	0	7	85	8	0	0	
127	14.6	0	11	78	11	0	0	
128	9.7	0	14	78	7	1	0	
129	16.3	0	6	88	5	1	0	
130	10.5	0	12	82	6	0	0	
Mean	14.1	0.0	10.1	83.3	6.1	0.5	0.0	
S.D.	4.15	0.00	3.81	4.69	2.64	0.53	0.00	

Group IV 500 mg/kg/day

181	7.9	0	11	83	5	1	0	
182	8.7	0	8	82	10	0	0	
183	10.7	0	11	87	2	0	0	
184	9.5	0	6	88	6	0	0	
185	9.2	0	8	88	2	2	0	
186	10.5	0	11	88	1	0	0	
187	16.2	0	1	85	13	1	0	
188	8.0	0	7	88	5	0	0	
189	15.3	0	8	87	5	0	0	
190	13.6	0	5	91	2	2	0	
Mean	11.0	0.0	7.6	86.7	5.1	0.6	0.0	
S.D.	3.02	0.00	3.13	2.67	3.84	0.84	0.00	

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT		NEUT		EO	BASO	COMMENT
		NON SEG	SEG	LYMPH	MONO			

Group I 0 mg/kg/day

31	5.8	0	10	86	0	4	0	
32	10.5	0	6	92	2	0	0	
33	8.9	0	5	84	9	2	0	
34 <sup>a</sup>								
35	8.3	0	10	82	8	0	0	
36	8.4	0	4	88	8	0	0	
37	6.0	0	9	90	0	1	0	
38	9.5	0	4	87	6	3	0	
39	8.9	0	9	85	5	1	0	
40	12.6	0	9	83	8	0	0	
Mean	8.8	0.0	7.3	86.3	5.1	1.2	0.0	
S.D.	2.09	0.00	2.55	3.28	3.59	1.48	0.00	

Group II 30 mg/kg/day

91	8.0	0	9	89	2	0	0	
92	14.9	0	7	88	4	1	0	
93	7.0	0	13	80	7	0	0	
94	8.6	0	12	82	5	1	0	
95	9.2	0	7	87	3	3	0	
96	8.7	0	7	88	5	0	0	
97	8.0	0	10	84	6	0	0	
98	8.8	0	2	91	3	4	0	
99 <sup>b</sup>								
100	7.1	0	9	84	6	1	0	
Mean	8.9	0.0	8.4	85.9	4.6	1.1	0.0	
S.D.	2.36	0.00	3.24	3.59	1.67	1.45	0.00	

<sup>a</sup> broken tube

<sup>b</sup> clotted specimen

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006 FEMALES Day of Test 43

ANIMAL NUMBER	WBC $\times 10^3/\text{ul}$	NEUT		LYMPH	MONO	EO	BASO	COMMENT
		NON SEG	SEG					

Group III 125 mg/kg/day

151	12.2	0	11	83	5	1	0	
152	6.5	0	14	83	2	1	0	
153	5.2	0	5	91	4	0	0	
154	11.0	0	4	90	6	0	0	
155	10.9	0	13	80	6	1	0	
156	9.0	0	12	87	1	0	0	
157	9.6	0	2	95	2	1	0	
158	5.5	0	14	84	2	0	0	
159	7.7	0	15	76	8	1	0	
160	7.6	0	13	80	7	0	0	
Mean	8.5	0.0	10.3	84.9	4.3	0.5	0.0	
S.D.	2.42	0.00	4.76	5.82	2.45	0.53	0.00	

Group IV 500 mg/kg/day

211	6.5	0	7	89	4	0	0	
212	8.9	0	11	82	6	1	0	
213	15.1	0	10	84	5	1	0	
214	8.5	0	6	88	6	0	0	
215	12.4	0	3	96	1	0	0	
216	6.6	0	12	80	7	1	0	Rare HJB <sup>a</sup>
217	9.6	0	5	89	6	0	0	
218	4.3	0	17	70	7	6	0	
219	7.8	0	9	81	9	1	0	
220	8.5	0	11	82	6	1	0	
Mean	8.8	0.0	9.1	84.1	5.7	1.1	0.0	
S.D.	3.07	0.00	4.04	6.98	2.11	1.79	0.00	

<sup>a</sup> HJB = Howell Jolly Body

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

MALES

Day of Test 92

ANIMAL

NUMBER	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
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Group I 0 mg/kg/day

11	8.45	46.2	15.3	8.4	55	18.1	33.1
12	8.78	48.4	16.0	8.7	55	18.2	33.1
13	7.57	42.8	14.3	14.6	56	18.9	33.4
14	8.36	50.1	16.1	7.3	60	19.3	32.1
15	8.16	44.6	15.0	12.1	55	18.4	33.6
16	7.87	43.8	14.8	12.8	56	18.8	33.8
17	7.97	43.5	14.3	9.2	54	17.9	32.9
18	7.30	41.8	14.2	7.5	57	19.5	34.0
19	7.98	44.5	14.6	6.2	56	18.3	32.8
20	6.88	41.9	14.5	9.2	61	21.1	34.6
Mean	7.93	44.8	14.9	9.6	56.5	18.9	33.3
S.D.	0.56	2.73	0.69	2.69	2.3	0.95	0.70

Group II 30 mg/kg/day

71	8.22	45.1	14.7	9.8	55	17.9	32.6
72	8.19	44.9	15.5	9.1	55	18.9	34.5
73	7.79	41.5	13.8	8.0	53	17.7	33.3
74	7.46	40.4	13.9	8.5	54	18.6	34.4
75	7.84	44.4	15.2	11.6	56	19.4	34.2
76	7.45	43.8	14.6	12.3	59	19.6	33.3
77	8.29	45.7	15.3	16.5	55	18.5	33.5
78	8.06	43.0	14.2	14.4	53	17.6	33.0
79	7.68	43.5	15.3	15.5	57	19.9	35.2
80	7.87	42.5	14.2	9.2	54	18.0	33.4
Mean	7.89	43.5	14.7	11.5	55.1	18.6	33.7
S.D.	0.30	1.67	0.63	3.08	1.9	0.82	0.80

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

MALES

Day of Test 92

ANIMAL

NUMBER	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
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Group III 125 mg/kg/day

131	8.09	45.4	15.3	9.4	56	18.9	33.7
132	6.70	36.8	12.5	8.6	55	18.7	34.0
134	6.69	38.6	13.2	13.1	57	19.7	34.2
135	7.89	44.6	15.0	11.8	56	19.0	33.6
136	8.85	48.6	16.3	11.2	55	18.4	33.5
137	8.06	44.8	15.0	9.0	55	18.6	33.5
138	8.08	45.7	15.1	11.4	56	18.7	33.0
139	7.86	43.6	14.1	13.7	55	17.9	32.3
140	7.97	44.6	14.7	8.7	56	18.4	33.0
141	8.17	47.0	15.2	12.6	57	18.6	32.3
Mean	7.84	44.0	14.6	11.0	55.8	18.7	33.3
S.D.	0.66	3.61	1.10	1.91	0.8	0.47	0.65

Group IV 500 mg/kg/day

191	7.41	42.0	13.7	12.4	57	18.5	32.6
192	7.59	41.3	14.2	7.7	55	18.7	34.4
193	8.22	44.4	14.6	6.8	54	17.8	32.9
194	7.78	44.6	14.5	9.7	57	18.6	32.5
195	8.03	45.5	15.0	10.5	56	18.7	33.0
196	7.42	41.4	13.9	8.7	56	18.7	33.6
197	7.31	41.8	14.6	7.9	57	20.0	34.9
198	8.63	47.7	15.4	8.2	55	17.8	32.3
199	7.44	40.5	13.5	7.8	54	18.1	33.3
200	7.57	43.3	14.9	15.4	57	19.7	34.4
Mean	7.74	43.3	14.4	9.5	55.8	18.7	33.4
S.D.	0.43	2.27	0.60	2.64	1.2	0.72	0.90

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

FEMALES

Day of Test 92

ANIMAL

NUMBER	RBC $\times 10^6/\text{ul}$	PCV	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
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Group I 0 mg/kg/day

41	7.24	41.5	14.6	8.2	57	20.2	35.2
42	7.78	47.6	16.0	9.6	61	20.6	33.6
43	7.27	41.0	14.4	7.6	56	19.8	35.1
44	7.24	40.6	13.5	6.7	56	18.6	33.3
45	8.84	48.8	16.4	7.2	55	18.6	33.6
46	7.70	45.0	15.1	7.1	58	19.6	33.6
47	8.09	45.7	15.5	7.9	56	19.2	33.9
48	7.65	45.9	15.8	12.2	60	20.7	34.4
49	7.17	41.5	14.1	4.0	58	19.7	34.0
50	7.77	44.2	14.9	8.0	57	19.2	33.7
Mean	7.68	44.2	15.0	7.9	57.4	19.6	34.0
S.D.	0.51	2.91	0.91	2.09	1.9	0.74	0.66

Group II 30 mg/kg/day

101	7.94	44.1	14.9	5.6	55	18.8	33.8
102	8.67	47.0	15.7	3.7	54	18.1	33.4
103	6.78	39.2	13.5	8.3	58	19.9	34.4
104	7.36	41.5	14.3	7.5	56	19.4	34.5
105	8.03	45.7	15.8	8.2	57	19.7	34.6
106	7.89	45.2	15.4	5.4	57	19.5	34.1
107	8.36	47.6	16.0	16.8	57	19.1	33.6
108	7.41	41.9	14.4	6.8	56	19.4	34.4
109	7.29	41.7	14.2	7.6	57	19.5	34.1
110	7.22	40.5	13.8	9.2	56	19.1	34.1
Mean	7.70	43.4	14.8	7.9	56.3	19.3	34.1
S.D.	0.58	2.88	0.89	3.52	1.2	0.51	0.40

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values

TRL Study #032-006

FEMALES

Day of Test 92

ANIMAL

NUMBER	RBC $\times 10^6/\text{ul}$	PCV %	HGB g/dl	WBC $\times 10^3/\text{ul}$	MCV fl	MCH pg	MCHC g/dl
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Group III 125 mg/kg/day

161	7.54	41.7	14.4	6.1	55	19.1	34.5
162	7.96	44.6	15.0	4.2	56	18.8	33.6
163	7.42	41.8	14.7	6.2	56	19.8	35.2
164	6.89	38.5	13.3	7.9	56	19.3	34.5
165	7.54	43.1	14.6	5.9	57	19.4	33.9
166	7.81	45.7	15.8	6.9	59	20.2	34.6
167	7.93	44.2	15.4	7.1	56	19.4	34.8
168	7.20	42.0	14.3	7.6	58	19.9	34.0
169	7.21	42.0	14.3	6.1	58	19.8	34.0
170	7.28	41.8	14.2	6.3	57	19.5	34.0
Mean	7.48	42.5	14.6	6.4	56.8	19.5	34.3
S.D.	0.35	2.00	0.69	1.04	1.2	0.41	0.49

Group IV 500 mg/kg/day

221	7.33	41.3	14.5	9.8	56	19.8	35.1
222	7.64	42.9	14.8	7.6	56	19.4	34.5
223	8.18	44.0	14.6	6.8	54	17.8	33.2
225	7.26	41.9	14.3	8.3	57	19.7	34.1
226	7.19	42.2	14.3	5.4	59	19.9	33.9
227	8.36	45.1	15.3	6.7	54	18.3	33.9
228	7.67	43.2	14.9	6.5	56	19.4	34.5
229	8.20	44.9	15.1	5.0	55	18.4	33.6
230	7.56	43.2	15.0	6.2	57	19.8	34.7
231	8.12	49.2	16.0	10.7	60	19.7	32.5
Mean	7.75	43.8	14.9	7.3	56.4	19.2	34.0
S.D.	0.43	2.26	0.52	1.83	2.0	0.76	0.77

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

MALES

Day of Test 92

ANIMAL NUMBER	WBC $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	NEUT. $\times 10^3/\text{ul}$	LYMPH. $\times 10^3/\text{ul}$	MONO. $\times 10^3/\text{ul}$	EO. $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
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Group I 0 mg/kg/day

11	8.4	1.1	6.4	0.9	0.0	0.0	741
12	8.7	0.4	7.5	0.8	0.0	0.0	896
13	14.6	1.2	13.3	0.0	0.1	0.0	897
14	7.3	0.5	6.2	0.5	0.1	0.0	645
15	12.1	0.7	10.9	0.5	0.0	0.0	803
16	12.8	1.0	11.1	0.6	0.0	0.0	570
17	9.2	0.7	8.0	0.4	0.1	0.0	827
18	7.5	1.3	5.9	0.2	0.1	0.0	635
19	6.2	0.4	5.7	0.1	0.0	0.0	451
20	9.2	0.7	8.1	0.3	0.1	0.0	743
Mean	9.6	0.8	8.3	0.4	0.1	0.0	720.8
S.D.	2.69	0.33	2.60	0.29	0.05	0.00	145.04

Group II 30 mg/kg/day

71	9.8	1.5	7.7	0.4	0.2	0.0	978
72	9.1	1.1	7.1	0.6	0.3	0.0	579
73	8.0	0.5	7.0	0.6	0.0	0.0	822
74	8.5	0.7	7.0	0.8	0.1	0.0	795
75	11.6	0.8	9.7	0.8	0.2	0.0	953
76	12.3	1.1	11.1	0.1	0.0	0.0	720
77	16.5	2.5	13.0	1.0	0.0	0.0	701
78	14.4	2.6	10.5	1.3	0.0	0.0	909
79	15.5	0.8	14.1	0.5	0.2	0.0	651
80	9.2	0.1	8.6	0.4	0.1	0.0	618
Mean	11.5	1.2	9.6	0.7	0.1	0.0	772.6
S.D.	3.08	0.82	2.57	0.34	0.11	0.00	141.56

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006		MALES					Day of Test	92	
ANIMAL NUMBER		WBC $\times 10^3/\text{ul}$	ABS. $\times 10^3/\text{ul}$	NEUT. $\times 10^3/\text{ul}$	LYMPH. $\times 10^3/\text{ul}$	MONO. $\times 10^3/\text{ul}$	EO. $\times 10^3/\text{ul}$	BASO. $\times 10^3/\text{ul}$	PLT $\times 10^3/\text{ul}$
<b>Group III      125 mg/kg/day</b>									
131		9.4	0.8		8.1	0.5	0.0	0.0	754
132		8.6	0.9		7.2	0.5	0.0	0.0	557
134		13.1	5.2		7.2	0.5	0.1	0.0	1260
135		11.8	1.5		8.9	0.9	0.5	0.0	606
136		11.2	0.3		10.3	0.6	0.0	0.0	821
137		9.0	1.1		7.0	0.7	0.2	0.0	758
138		11.4	1.9		8.9	0.5	0.1	0.0	886
139		13.7	1.6		11.6	0.3	0.1	0.0	805
140		8.7	1.5		6.6	0.6	0.0	0.0	717
141		12.6	1.6		10.5	0.5	0.0	0.0	892
Mean		11.0	1.6		8.6	0.6	0.1	0.0	805.6
S.D.		1.91	1.34		1.71	0.16	0.16	0.00	192.95
<b>Group IV      500 mg/kg/day</b>									
191		12.4	0.4		11.8	0.2	0.0	0.0	889
192		7.7	1.0		6.5	0.2	0.1	0.0	869
193		6.8	0.6		5.8	0.3	0.1	0.0	611
194		9.7	1.1		7.9	0.6	0.2	0.0	711
195		10.5	0.8		9.2	0.3	0.1	0.0	725
196		8.7	1.0		7.0	0.7	0.0	0.0	707
197		7.9	1.8		5.1	1.0	0.0	0.0	663
198		8.2	1.4		6.4	0.4	0.0	0.0	608
199		7.8	0.9		5.9	0.9	0.0	0.0	801
200		15.4	1.8		13.1	0.2	0.3	0.0	616
Mean		9.5	1.1		7.9	0.5	0.1	0.0	720.0
S.D.		2.64	0.47		2.69	0.30	0.10	0.00	103.33

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006		FEMALES						Day of Test	92
ANIMAL NUMBER		WBC $\times 10^3/\text{ul}$	ABS. NEUT. $\times 10^3/\text{ul}$	ABS. LYMPH. $\times 10^3/\text{ul}$	ABS. MONO. $\times 10^3/\text{ul}$	ABS. EO. $\times 10^3/\text{ul}$	ABS. BASO. $\times 10^3/\text{ul}$	ABS. PLT $\times 10^3/\text{ul}$	
<b>Group I      0 mg/kg/day</b>									
41		8.2	0.5	7.1	0.6	0.1	0.0	739	
42		9.6	0.2	9.0	0.3	0.1	0.0	646	
43		7.6	0.5	6.7	0.4	0.1	0.0	885	
44		6.7	0.1	6.4	0.2	0.0	0.0	768	
45		7.2	0.3	6.5	0.4	0.0	0.0	903	
46		7.1	0.3	6.3	0.5	0.0	0.0	629	
47		7.9	0.2	7.4	0.2	0.0	0.0	502	
48		12.2	0.9	10.6	0.7	0.0	0.0	863	
49		4.0	0.6	3.0	0.2	0.1	0.0	803	
50		8.0	0.6	7.4	0.0	0.0	0.0	611	
Mean		7.9	0.4	7.0	0.4	0.0	0.0	734.9	
S.D.		2.09	0.24	1.96	0.21	0.05	0.00	134.02	
<b>Group II      30 mg/kg/day</b>									
101		5.6	0.7	4.1	0.7	0.1	0.0	682	
102		3.7	0.7	3.0	0.0	0.0	0.0	814	
103		8.3	1.0	6.4	0.8	0.1	0.0	960	
104		7.5	0.3	6.7	0.5	0.0	0.0	641	
105		8.2	0.8	7.1	0.2	0.0	0.0	661	
106		5.4	0.3	4.8	0.3	0.1	0.0	891	
107		16.8	2.7	12.4	1.7	0.0	0.0	860	
108		6.8	0.5	6.1	0.1	0.1	0.0	605	
109		7.6	0.6	6.4	0.5	0.1	0.0	691	
110		9.2	1.5	7.0	0.6	0.1	0.0	1073	
Mean		7.9	0.9	6.4	0.5	0.1	0.0	787.8	
S.D.		3.52	0.72	2.50	0.48	0.05	0.00	156.04	

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006		FEMALES				Day of Test 92				
ANIMAL NUMBER		WBC $\times 10^3/\mu\text{l}$	NEUT. $\times 10^3/\mu\text{l}$	ABS. $\times 10^3/\mu\text{l}$	LYMPH. $\times 10^3/\mu\text{l}$	MONO. $\times 10^3/\mu\text{l}$	EO. $\times 10^3/\mu\text{l}$	ABS. $\times 10^3/\mu\text{l}$	BASO. $\times 10^3/\mu\text{l}$	PLT $\times 10^3/\mu\text{l}$
<b>Group III 125 mg/kg/day</b>										
161		6.1	0.1	5.9	0.0	0.1	0.0	0.0	869	
162		4.2	0.3	3.6	0.3	0.1	0.0	0.0	783	
163		6.2	0.4	5.6	0.2	0.0	0.0	0.0	685	
164		7.9	1.1	6.2	0.4	0.2	0.0	0.0	841	
165		5.9	0.6	4.9	0.4	0.1	0.0	0.0	689	
166		6.9	0.7	5.8	0.3	0.1	0.0	0.0	929	
167		7.1	0.4	6.4	0.3	0.0	0.0	0.0	714	
168		7.6	0.6	6.9	0.1	0.0	0.0	0.0	544	
169		6.1	0.3	5.5	0.3	0.0	0.0	0.0	497	
170		6.3	1.0	5.0	0.2	0.1	0.0	0.0	611	
Mean		6.4	0.6	5.6	0.3	0.1	0.0	0.0	716.2	
S.D.		1.04	0.32	0.92	0.13	0.07	0.00	0.00	141.09	
<b>Group IV 500 mg/kg/day</b>										
221		9.8	1.4	8.1	0.2	0.1	0.0	0.0	839	
222		7.6	0.3	7.1	0.2	0.0	0.0	0.0	443	
223		6.8	0.9	5.3	0.6	0.0	0.0	0.0	793	
225		8.3	0.3	7.7	0.2	0.0	0.0	0.0	803	
226		5.4	0.3	4.6	0.5	0.1	0.0	0.0	832	
227		6.7	0.8	5.5	0.4	0.0	0.0	0.0	752	
228		6.5	0.5	5.5	0.4	0.1	0.0	0.0	932	
229		5.0	0.5	4.5	0.1	0.0	0.0	0.0	627	
230		6.2	0.4	5.3	0.6	0.0	0.0	0.0	590	
231		10.7	0.1	10.4	0.2	0.0	0.0	0.0	883	
Mean		7.3	0.6	6.4	0.3	0.0	0.0	0.0	749.4	
S.D.		1.83	0.38	1.88	0.18	0.05	0.00	0.00	150.96	

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

MALES

Day of Test 92

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT %	NEUT %	LYMPH %	MONO %	EO %	BASO %	COMMENT
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Group I 0 mg/kg/day

11	8.4	0	13	76	11	0	0	
12	8.7	0	5	86	9	0	0	
13	14.6	0	8	91	0	1	0	
14	7.3	0	7	85	7	1	0	
15	12.1	0	6	90	4	0	0	
16	12.8	0	8	87	5	0	0	
17	9.2	0	8	87	4	1	0	
18	7.5	0	17	79	3	1	0	Rare HJB <sup>a</sup>
19	6.2	0	6	92	2	0	0	
20	9.2	0	8	88	3	1	0	
Mean	9.6	0.0	8.6	86.1	4.8	0.5	0.0	
S.D.	2.69	0.00	3.66	5.09	3.33	0.53	0.00	

Group II 30 mg/kg/day

71	9.8	0	15	79	4	2	0	
72	9.1	0	12	78	7	3	0	
73	8.0	0	6	87	7	0	0	
74	8.5	0	8	82	9	1	0	
75	11.6	0	7	84	7	2	0	
76	12.3	0	9	90	1	0	0	
77	16.5	0	15	79	6	0	0	
78	14.4	0	18	73	9	0	0	
79	15.5	0	5	91	3	1	0	
80	9.2	0	1	94	4	1	0	
Mean	11.5	0.0	9.6	83.7	5.7	1.0	0.0	
S.D.	3.08	0.00	5.30	6.70	2.63	1.05	0.00	

<sup>a</sup>HJB = Howell Jolly Body

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006 MALES Day of Test 92

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT %	NEUT %	LYMPH %	MONO %	EO %	BASO %	COMMENT
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Group III 125 mg/kg/day

131	9.4	0	9	86	5	0	0	
132	8.6	0	10	84	6	0	0	
134	13.1	0	40	55	4	1	0	
135	11.8	0	13	75	8	4	0	
136	11.2	0	3	92	5	0	0	
137	9.0	0	12	78	8	2	0	
138	11.4	0	17	78	4	1	0	
139	13.7	0	12	85	2	1	0	
140	8.7	0	17	76	7	0	0	
141	12.6	0	13	83	4	0	0	
Mean	11.0	0.0	14.6	79.2	5.3	0.9	0.0	
S.D.	1.91	0.00	9.79	9.99	1.95	1.29	0.00	

Group IV 500 mg/kg/day

191	12.4	0	3	95	2	0	0	
192	7.7	0	13	84	2	1	0	
193	6.8	0	9	85	4	2	0	
194	9.7	0	11	81	6	2	0	
195	10.5	0	8	88	3	1	0	
196	8.7	0	11	81	8	0	0	
197	7.9	0	23	64	13	0	0	
198	8.2	0	17	78	5	0	0	1 NRBC <sup>a</sup>
199	7.8	0	12	76	12	0	0	
200	15.4	0	12	85	1	2	0	
Mean	9.5	0.0	11.9	81.7	5.6	0.8	0.0	
S.D.	2.64	0.00	5.32	8.19	4.20	0.92	0.00	

<sup>a</sup>NRBC = Nucleated Red Blood Cell

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006

FEMALES

Day of Test 92

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT NON SEG %	NEUT SEG %	LYMPH %	MONO %	EO %	BASO %	COMMENT
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Group I 0 mg/kg/day

41	8.2	0	6	86	7	1	0	
42	9.6	0	2	94	3	1	0	
43	7.6	0	6	88	5	1	0	
44	6.7	0	1	96	3	0	0	
45	7.2	0	4	90	6	0	0	
46	7.1	0	4	89	7	0	0	
47	7.9	0	3	94	3	0	0	
48	12.2	0	7	87	6	0	0	
49	4.0	0	16	76	6	2	0	
50	8.0	0	7	93	0	0	0	
Mean	7.9	0.0	5.6	89.3	4.6	0.5	0.0	
S.D.	2.09	0.00	4.20	5.76	2.27	0.71	0.00	

Group II 30 mg/kg/day

101	5.6	0	13	73	12	2	0	1 NRBC <sup>a</sup>
102	3.7	0	19	80	1	0	0	
103	8.3	0	12	77	10	1	0	
104	7.5	0	4	89	7	0	0	
105	8.2	0	10	87	3	0	0	
106	5.4	0	6	88	5	1	0	1 NRBC
107	16.8	0	16	74	10	0	0	
108	6.8	0	8	89	2	1	0	
109	7.6	0	8	84	7	1	0	
110	9.2	0	16	76	7	1	0	
Mean	7.9	0.0	11.2*	81.7*	6.4	0.7	0.0	
S.D.	3.52	0.00	4.85	6.43	3.66	0.67	0.00	

\* P less than or equal to 0.05

<sup>a</sup>NRBC = Nucleated Red Blood Cell

Table 5 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Hematology Values - Differential

TRL Study #032-006 FEMALES Day of Test 92

ANIMAL NUMBER	WBC $\times 10^3/\mu\text{l}$	NEUT		LYMPH	MONO	EO	BASO	COMMENT
		NON SEG	SEG					

Group III 125 mg/kg/day

161	6.1	0	2	96	0	2	0	
162	4.2	0	7	85	6	2	0	
163	6.2	0	7	90	3	0	0	
164	7.9	0	14	79	5	2	0	
165	5.9	0	10	83	6	1	0	
166	6.9	0	10	84	5	1	0	
167	7.1	0	6	90	4	0	0	
168	7.6	0	8	91	1	0	0	
169	6.1	0	5	90	5	0	0	
170	6.3	0	16	80	3	1	0	
Mean	6.4	0.0	8.5	86.8	3.8	0.9	0.0	
S.D.	1.04	0.00	4.17	5.43	2.04	0.88	0.00	

Group IV 500 mg/kg/day

221	9.8	0	14	83	2	1	0	
222	7.6	0	4	94	2	0	0	
223	6.8	0	13	78	9	0	0	
225	8.3	0	4	93	3	0	0	
226	5.4	0	5	85	9	1	0	
227	6.7	0	12	82	6	0	0	
228	6.5	0	7	85	6	2	0	
229	5.0	0	10	89	1	0	0	
230	6.2	0	6	85	9	0	0	
231	10.7	0	1	97	2	0	0	
Mean	7.3	0.0	7.6	87.1	4.9	0.4	0.0	
S.D.	1.83	0.00	4.40	5.99	3.28	0.70	0.00	

Table 6

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006		MALES			Day of Test -3		
ANIMAL NUMBER	GLUC	BUN	ALK PHOS	TP	ALB	GLOB	A/G
	mg/dl	mg/dl	U/l	g/dl	g/dl	g/dl	
Group V		Baseline					
241	238.8	20.1	300.6	5.62	3.23	2.39	1.35
242	252.8	16.7	350.5	5.70	3.34	2.36	1.42
243	129.4	15.7	383.4	5.37	3.09	2.28	1.36
244	240.5	18.4	254.1	5.52	3.34	2.18	1.53
245	237.6	18.5	310.9	5.60	3.29	2.31	1.42
246	227.1	15.9	338.7	5.30	3.09	2.21	1.40
247	227.0	15.8	396.8	5.48	3.23	2.25	1.44
248	232.2	22.5	391.6	5.92	3.48	2.44	1.43
249	234.6	19.3	301.3	5.19	3.21	1.98	1.62
250	251.0	21.2	318.3	5.48	3.32	2.16	1.54
Mean	227.10	18.41	334.62	5.52	3.26	2.26	1.45
S.D.	35.41	2.39	46.36	0.21	0.12	0.13	0.09

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006		FEMALES				Day of Test -3	
ANIMAL NUMBER	GLUC	BUN	ALK PHOS	TP	ALB	GLOB	A/G
	mg/dl	mg/dl	U/l	g/dl	g/dl	g/dl	
Group V Baseline							
251	194.6	15.5	195.9	5.67	3.19	2.48	1.29
252	191.1	16.8	275.3	6.37	3.74	2.63	1.42
253	212.2	15.9	218.6	5.69	3.45	2.24	1.54
254	223.5	15.6	301.2	6.03	3.48	2.55	1.36
255	193.1	17.1	269.7	5.82	3.38	2.44	1.39
256	188.1	18.1	284.8	5.81	3.27	2.54	1.29
257	203.3	14.9	195.0	5.59	3.30	2.29	1.44
258	175.0	14.0	202.3	5.46	3.23	2.23	1.45
259	205.4	16.1	203.3	6.30	3.57	2.73	1.31
260	200.3	16.3	294.0	5.70	3.20	2.50	1.28
Mean	198.66	16.03	244.01	5.84	3.38	2.46	1.38
S.D.	13.52	1.15	44.51	0.30	0.18	0.17	0.09

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test -3

ANIMAL NUMBER	TOTAL									
	Na	K	Cl	TCO <sub>2</sub>	CHOL	BILI	Ca	PHOS	SGOT	SGPT
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl	U/l	U/l
Group V	Baseline									
241	146.0	7.65	102.0	31.1	87.3	0.39	12.98	13.14	70.2	43.2
242	144.7	7.12	102.0	31.2	87.9	0.38	12.92	11.48	67.9	48.0
243	143.5	7.64	100.0	33.0	86.7	0.35	12.78	12.76	63.8	42.0
244	144.4	7.43	102.0	29.4	81.2	0.32	12.38	11.02	69.3	38.5
245	144.8	6.21	103.0	30.9	82.7	0.42	11.42	11.02	67.0	41.2
246	144.4	7.26	102.0	34.0	82.7	0.28	13.14	12.46	59.1	43.8
247	145.9	7.00	106.0	31.1	62.6	0.43	12.58	11.72	70.9	41.9
248	145.7	7.20	102.0	32.7	97.3	0.24	13.38	12.82	59.8	41.0
249	144.0	7.30	104.0	32.9	86.6	0.25	12.02	11.24	59.4	39.5
250	143.7	7.12	103.0	31.9	69.4	0.28	11.82	11.48	67.3	40.5
Mean	144.7	7.19	102.6	31.8	82.4	0.33	12.54	11.91	65.5	42.0
S.D.	0.90	0.41	1.58	1.34	9.86	0.07	0.63	0.80	4.60	2.65

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

FEMALES

Day of Test -3

ANIMAL NUMBER	FEMALES								Day of Test -3	
	Na	K	Cl	TCO <sub>2</sub>	CHOL	BILI	Ca	PHOS		
	meq/l	meq/l	mmmol/l	mmmol/l	mg/dl	mg/dl	mg/dl	mg/dl	U/l	U/l
<b>Group V Baseline</b>										
251	144.0	7.43	101.0	33.0	97.9	0.30	12.50	12.04	51.1	33.8
252	144.9	7.27	100.0	31.5	102.6	0.48	11.90	11.94	59.8	41.8
253	146.4	6.73	102.0	31.5	76.2	0.31	12.58	11.82	56.9	40.3
254	145.1	7.50	102.0	30.1	101.3	0.29	13.06	10.68	59.9	37.9
255	147.3	6.71	104.0	31.8	91.8	0.36	15.00	13.14	65.3	43.0
256	146.6	6.80	103.0	32.1	90.5	0.35	12.88	11.50	65.9	39.6
257	146.1	7.59	104.0	32.1	85.0	0.43	12.06	11.70	61.4	52.4
258	146.1	6.51	100.0	32.8	99.9	0.28	12.96	11.72	53.3	41.1
259	149.5	7.00	105.0	29.5	120.3	0.41	13.20	11.88	55.7	35.5
260	143.4	6.95	102.0	30.6	80.3	0.29	12.90	10.66	49.0	38.3
Mean	145.9	7.05	102.3	31.5	94.6	0.35	12.90	11.71	57.8	40.4
S.D.	1.74	0.38	1.70	1.13	12.77	0.07	0.85	0.70	5.69	5.08

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test 43

ANIMAL NUMBER	GLUC mg/dl	BUN mg/dl	A/G	TP g/dl	ALB g/dl	ALK U/l	PHOS U/l	SGOT U/l	SGPT U/l	GLOB g/dl	CREAT mg/dl
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Group I 0 mg/kg/day

1	307.9	16.6	1.12	6.31	3.33	151.9	53.0	33.0	2.98	0.6
2	259.2	19.3	1.11	7.12	3.75	137.9	47.0	31.8	3.37	0.7
3	229.1	21.2	0.94	7.00	3.39	110.2	45.9	27.5	3.61	0.6
4	228.5	18.9	1.12	6.48	3.42	190.7	51.2	38.2	3.06	0.6
5	307.5	18.8	1.13	6.76	3.59	187.4	52.0	26.9	3.17	0.6
6	345.6	17.2	0.99	6.87	3.41	109.2	39.9	22.3	3.46	0.6
7	330.6	18.8	1.25	6.65	3.69	211.2	68.0	42.1	2.96	0.7
8	303.0	22.4	0.94	7.85	3.81	220.8	51.6	32.0	4.04	0.7
9	196.8	19.7	1.10	6.41	3.36	160.7	51.0	34.3	3.05	0.6
10	241.6	15.2	1.10	7.04	3.69	234.6	63.8	46.6	3.35	0.6
Mean	275.0	18.8	1.08	6.85	3.54	171.5	52.3	33.5	3.31	0.63
S.D.	50.27	2.11	0.10	0.45	0.18	44.57	8.20	7.29	0.34	0.05

Group II 30 mg/kg/day

61	210.2	22.2	1.06	7.29	3.75	219.7	56.7	36.4	3.54	0.7
62	246.9	17.7	1.06	6.38	3.28	164.8	45.6	28.3	3.10	0.6
63	324.3	21.8	1.00	6.87	3.43	117.4	48.6	26.8	3.44	0.8
64	303.2	21.1	0.93	7.11	3.42	178.6	44.9	28.5	3.69	0.6
65	276.3	14.7	1.01	6.73	3.39	160.4	45.5	24.4	3.34	0.6
66	244.0	17.8	1.11	6.66	3.51	100.3	39.4	27.6	3.15	0.7
67	355.6	19.1	1.05	7.27	3.72	146.2	48.4	40.2	3.55	0.7
68	252.7	19.4	1.11	6.53	3.43	200.9	46.0	24.9	3.10	0.7
69	275.9	14.3	1.02	6.37	3.22	146.1	41.2	23.8	3.15	0.6
70	355.0	19.3	0.99	7.01	3.48	175.1	46.2	32.4	3.53	0.8
Mean	284.4	18.7	1.03	6.82	3.46	161.0	46.3	29.3	3.36	0.68
S.D.	49.09	2.70	0.06	0.34	0.17	35.88	4.65	5.41	0.22	0.08

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test 43

ANIMAL NUMBER	GLUC mg/dl	BUN mg/dl	A/G	TP g/dl	ALB g/dl	ALK U/l	PHOS U/l	SGOT U/l	SGPT U/l	GLOB g/dl	CREAT mg/dl
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Group III 125 mg/kg/day

121	261.0	20.0	1.10	6.59	3.45	225.8	53.8	30.4	3.14	0.7
122	213.5	17.9	1.20	6.44	3.51	189.2	47.6	29.2	2.93	0.6
123	282.0	19.5	1.00	7.07	3.54	130.7	45.2	27.3	3.53	0.7
124	276.9	21.5	1.07	6.79	3.51	126.4	47.7	37.0	3.28	0.7
125	355.1	17.9	1.08	6.93	3.60	210.8	68.3	38.7	3.33	0.6
126	265.7	17.0	0.97	7.00	3.44	207.8	51.1	34.9	3.56	0.6
127	243.2	19.8	1.06	6.97	3.59	164.5	51.6	31.0	3.38	0.7
128	288.4	20.7	1.08	6.67	3.47	108.3	59.1	35.3	3.20	0.6
129	216.1	13.5	1.07	7.01	3.63	143.9	52.2	37.1	3.38	0.7
130	224.7	18.5	1.01	7.09	3.57	203.9	47.5	34.6	3.52	0.6
Mean	262.7	18.6	1.06	6.86	3.53	171.1	52.4	33.6	3.33	0.65
S.D.	42.43	2.28	0.06	0.22	0.07	41.73	6.86	3.82	0.20	0.05

Group IV 500 mg/kg/day

181	289.0	18.5	1.13	6.38	3.38	112.8	47.4	31.4	3.00	0.6
182	379.4	15.2	1.03	6.80	3.45	131.7	63.3	44.5	3.35	0.7
183	278.6	22.1	0.98	6.68	3.31	141.8	53.1	33.8	3.37	0.7
184	248.3	16.4	1.10	6.46	3.38	103.3	42.6	31.8	3.08	0.6
185	289.7	18.5	1.00	6.79	3.40	132.8	45.8	31.8	3.39	0.7
186	190.8	23.7	1.03	7.02	3.57	105.5	42.2	30.4	3.45	0.6
187	213.8	20.4	1.08	6.52	3.38	182.1	48.8	34.8	3.14	0.7
188	207.4	19.7	1.05	6.69	3.43	146.4	52.2	34.0	3.26	0.7
189	231.8	16.0	1.25	6.18	3.43	148.7	48.8	26.7	2.75	0.7
190	295.2	17.5	1.15	6.31	3.38	138.9	46.1	32.0	2.93	0.6
Mean	262.4	18.8	1.08	6.58	3.41	134.4	49.0	33.1	3.17	0.66
S.D.	55.91	2.72	0.08	0.26	0.07	23.52	6.15	4.59	0.23	0.05

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	GLUC mg/dl	BUN mg/dl	A/G	TP g/dl	ALB g/dl	ALK U/l	PHOS U/l	SGOT U/l	SGPT U/l	GLOB g/dl	CREAT mg/dl
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Group I 0 mg/kg/day

31	300.1	22.0	1.04	7.30	3.72	140.3	51.1	37.6	3.58	0.8
32	190.1	17.0	1.17	6.87	3.71	102.4	45.8	31.3	3.16	0.6
33	255.8	16.4	1.13	6.51	3.46	170.5	49.6	37.6	3.05	0.6
34	222.2	21.5	1.04	7.55	3.85	166.0	57.6	45.1	3.70	0.7
35	205.6	15.5	1.07	6.88	3.56	117.4	53.7	37.4	3.32	0.6
36	220.0	20.0	1.01	6.95	3.50	146.4	56.1	40.7	3.45	0.7
37	235.0	20.3	1.17	6.56	3.53	59.2	50.8	25.4	3.03	0.6
38	210.1	17.2	1.08	7.18	3.72	112.0	45.5	33.2	3.46	0.7
39	189.2	22.6	1.20	6.89	3.76	142.6	43.4	27.4	3.13	0.7
40	420.5	25.0	1.02	8.10	4.09	134.8	50.9	55.0	4.01	0.7
Mean	244.9	19.8	1.09	7.08	3.69	129.2	50.5	37.1	3.39	0.67
S.D.	70.00	3.12	0.07	0.48	0.19	32.90	4.61	8.68	0.32	0.07

Group II 30 mg/kg/day

91	222.9	24.4	1.13	7.35	3.90	134.4	58.1	32.3	3.45	0.7
92	211.6	16.1	1.17	6.94	3.74	118.6	47.1	26.9	3.20	0.7
93	241.0	20.8	1.12	6.98	3.69	100.7	64.2	40.2	3.29	0.6
94	277.5	18.7	1.18	6.66	3.61	174.2	50.7	34.7	3.05	0.6
95	215.1	17.3	1.12	6.71	3.55	87.4	66.4	37.4	3.16	0.6
96	208.5	18.9	1.15	7.09	3.79	154.2	45.1	30.7	3.30	0.7
97	197.1	16.3	1.03	7.07	3.58	121.0	40.9	31.2	3.49	0.6
98	271.6	23.1	1.05	8.15	4.17	101.3	53.6	28.6	3.98	0.6
99	237.7	14.6	1.11	7.02	3.70	120.0	50.3	33.3	3.32	0.6
100	303.0	16.7	1.09	7.32	3.81	73.5	48.0	27.1	3.51	0.7
Mean	238.6	18.7	1.12	7.13	3.75	118.5	52.4	32.2	3.38	0.64
S.D.	34.82	3.19	0.05	0.42	0.18	30.26	8.23	4.33	0.26	0.05

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	GLUC mg/dl	BUN mg/dl	A/G	TP g/dl	ALB g/dl	ALK			GLOB g/dl	CREAT mg/dl
						PHOS U/l	SGOT U/l	SGPT U/l		

Group III 125 mg/kg/day

151	185.7	12.5	1.06	7.45	3.83	113.6	74.1	44.1	3.62	0.7
152	350.0	21.9	1.03	7.26	3.69	173.9	45.1	31.1	3.57	0.6
153	270.8	19.2	1.15	6.98	3.73	115.7	51.0	28.5	3.25	0.6
154	230.8	15.4	1.12	7.24	3.82	71.6	52.2	41.4	3.42	0.7
155	256.9	18.0	1.21	7.11	3.89	99.8	37.6	31.8	3.22	0.6
156	267.3	24.4	1.10	8.35	4.37	112.8	43.8	36.4	3.98	0.7
157	214.5	12.1	1.18	6.94	3.76	80.6	47.8	33.9	3.18	0.7
158	227.8	15.5	1.14	6.87	3.66	77.3	48.6	32.3	3.21	0.6
159	235.9	15.1	1.02	6.97	3.52	117.9	55.7	29.8	3.45	0.6
160	190.8	16.2	1.09	7.76	4.05	127.1	47.4	31.9	3.71	0.6
Mean	243.1	17.0	1.11	7.29	3.83	109.0	50.3	34.1	3.46	0.64
S.D.	47.44	3.91	0.06	0.46	0.24	29.80	9.71	5.06	0.26	0.05

Group IV 500 mg/kg/day

211	192.5	19.8	1.14	6.67	3.55	156.2	60.9	51.9	3.12	0.6
212	241.0	17.8	1.17	6.96	3.75	57.0	39.8	26.3	3.21	0.6
213	255.3	19.4	1.10	6.88	3.61	120.6	47.9	32.4	3.27	0.6
214	260.1	20.7	1.23	8.20	4.52	55.4	64.4	46.7	3.68	0.8
215	232.3	31.2	1.24	6.69	3.71	117.7	60.8	31.3	2.98	0.8
216	366.8	17.5	1.06	7.23	3.72	162.1	51.3	29.0	3.51	0.8
217	219.0	14.5	1.08	6.91	3.58	73.0	51.9	27.9	3.33	0.7
218	193.1	19.4	1.08	7.71	4.01	160.9	45.0	30.7	3.70	0.7
219	197.0	17.7	1.09	6.76	3.52	181.0	51.8	34.4	3.24	0.7
220	272.5	17.9	1.08	7.19	3.74	108.4	52.1	34.0	3.45	0.6
Mean	243.0	19.6	1.13	7.12	3.77	119.2	52.6	34.5	3.35	0.69
S.D.	52.17	4.42	0.07	0.49	0.30	45.90	7.62	8.31	0.23	0.09

TRL STUDY #032-006

Conducted for:

RESEARCH TRIANGLE INSTITUTE  
P.O. Box 12194  
Research Triangle Park, North Carolina 27709

by:

TOXICITY RESEARCH LABORATORIES, LTD.  
510 West Hackley Avenue  
Muskegon, Michigan 49444

Rat Oral Subchronic Toxicity Study

Compound:

Normal Butanol

Start of Test (pretreatment):	August 19, 1985
Interim Necropsy:	October 7 and 8, 1985
Final Necropsy:	November 25 and 26, 1985

TRL Study #032-006

Study Director:

E. Crosby Tompkins by Robert Reed 28 Oct 1987

E. Crosby Tompkins, Ph.D.  
Diplomate, American Board of Toxicology

Date

Toxicologist:

Randall Reed by Will Cunn

28 Oct 1987

Randall Reed, B.A.

Date

Director of  
Pathology:

Bobby Joe Payne

28 Oct '87

Bobby Joe Payne, D.V.M., M.S., Ph.D.  
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Date

Head, Clinical  
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Aileen K. Tejchma

28 Oct. 1987

Aileen K. Tejchma, B.S., M.T. (ASCP)

Date

Histologist:

Dorothy Jensen

28 Oct. '87

Dorothy Jensen, B.S., H.T.L. (ASCP)

Date

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test 43

ANIMAL NUMBER	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
Group I		0 mg/kg/day						
1	147.4	7.71	102.0	34.0	12.47	8.64	70.8	0.34
2	147.7	7.05	95.0	38.5	13.42	10.99	93.5	0.33
3	148.7	6.41	99.0	37.0	13.56	9.29	111.0	0.31
4	147.5	7.66	103.0	36.4	12.58	8.50	69.1	0.36
5	148.1	8.56	102.0	34.7	14.51	10.94	63.3	0.25
6	147.8	9.10	103.0	33.4	14.17	10.95	62.6	0.37
7	149.7	9.56	103.0	31.9	14.56	15.16	86.3	0.22
8	146.8	11.85	102.0	35.1	14.85	11.86	87.1	0.52
9	148.1	7.33	100.0	35.0	13.08	10.06	76.1	0.20
10	149.2	5.11	99.0	38.4	13.29	9.23	108.8	0.26
Mean	148.1	8.03	100.8	35.4	13.65	10.56	82.9	0.32
S.D.	0.88	1.86	2.57	2.14	0.84	1.97	17.58	0.09
Group II		30 mg/kg/day						
61	146.7	8.51	99.0	38.0	13.37	10.37	76.9	0.38
62	147.8	8.43	102.0	39.1	11.96	9.19	55.2	0.25
63	146.7	7.42	101.0	31.5	13.61	8.75	90.8	0.34
64	146.7	7.15	101.0	34.3	13.87	9.38	72.8	0.29
65	147.3	7.31	100.0	33.4	14.67	9.14	85.1	0.23
66	149.0	6.99	99.0	38.3	13.43	11.48	93.9	0.31
67	148.1	8.36	101.0	32.1	14.18	11.29	79.3	0.29
68	147.0	6.50	103.0	35.1	12.39	8.87	68.0	0.28
69	148.4	5.57	102.0	36.4	12.88	8.95	80.5	0.24
70	146.6	9.52	100.0	31.2	14.31	10.61	73.5	0.30
Mean	147.4	7.58	100.8	34.9	13.47	9.80	77.6	0.29
S.D.	0.85	1.14	1.32	2.92	0.86	1.04	11.26	0.05

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test 43

ANIMAL NUMBER	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
Group III 125 mg/kg/day								
121	149.4	8.58	104.0	34.8	13.21	9.66	67.7	0.35
122	148.9	6.01	99.0	40.6	13.27	11.75	98.3	0.24
123	146.2	7.55	102.0	33.5	13.39	8.33	63.1	0.31
124	148.5	7.39	103.0	33.2	13.23	9.28	60.7	0.32
125	147.9	8.87	102.0	33.5	14.61	11.48	80.5	0.26
126	147.6	8.01	100.0	33.9	13.02	10.51	60.3	0.30
127	148.7	6.60	99.0	38.3	14.64	9.40	90.2	0.37
128	146.3	8.49	101.0	35.4	13.13	9.45	65.5	0.25
129	151.2	5.85	102.0	35.8	12.25	8.00	99.7	0.20
130	150.6	5.56	99.0	40.4	13.29	8.78	66.9	0.33
Mean	148.5	7.29	101.1	35.9	13.40	9.66	75.3	0.29
S.D.	1.63	1.22	1.79	2.84	0.72	1.25	15.58	0.05
Group IV 500 mg/kg/day								
181	147.2	7.66	102.0	33.1	12.83	9.18	64.0	0.26
182	148.9	8.31	104.0	32.8	13.78	11.04	84.4	0.19
183	148.2	7.88	102.0	32.7	13.42	10.81	61.0	0.25
184	146.7	7.24	99.0	35.9	12.95	10.12	72.0	0.21
185	147.3	6.93	100.0	32.5	13.58	8.84	56.8	0.26
186	149.0	6.51	104.0	35.0	13.30	8.65	86.2	0.41
187	148.1	7.64	102.0	35.6	13.12	11.20	56.5	0.28
188	148.4	8.38	101.0	33.7	12.73	9.82	52.0	0.23
189	149.1	5.74	97.0	41.9	12.48	9.91	71.7	0.25
190	148.6	4.84	99.0	36.9	12.13	8.53	66.3	0.14
Mean	148.2	7.11	101.0	35.0	13.03	9.81	67.1*	0.25
S.D.	0.83	1.14	2.26	2.87	0.51	0.99	11.56	0.07

\* P less than or equal to 0.05

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
Group I 0 mg/kg/day								
31	142.5	10.49	103.0	31.8	13.93	9.74	81.6	0.32
32	146.4	7.82	103.0	30.4	12.52	9.59	67.3	0.25
33	148.0	6.72	104.0	34.3	12.52	9.23	69.2	0.23
34	148.6	5.82	104.0	35.5	12.88	6.70	71.8	0.35
35	146.9	7.61	103.0	33.4	12.44	7.02	99.7	0.22
36	145.1	7.38	102.0	34.2	13.54	8.62	73.1	0.24
37	145.7	7.33	105.0	29.5	11.77	7.68	73.8	0.19
38	148.7	7.87	103.0	33.6	12.47	8.30	86.3	0.26
39	145.9	7.71	101.0	34.2	12.56	9.00	72.7	0.28
40	145.6	10.37	102.0	28.6	13.62	13.76	88.5	0.51
Mean	146.3	7.91	103.0	32.6	12.83	8.96	78.4	0.29
S.D.	1.86	1.46	1.15	2.34	0.67	1.98	10.34	0.09
Group II 30 mg/kg/day								
91	144.9	8.69	103.0	34.0	13.27	7.13	85.4	0.33
92	145.5	7.43	100.0	35.8	12.18	10.05	96.3	0.33
93	145.4	7.53	103.0	33.3	12.85	8.12	55.7	0.33
94	146.0	7.07	102.0	35.3	12.59	7.43	62.7	0.17
95	146.0	8.02	103.0	31.6	12.34	8.51	95.3	0.26
96	145.4	8.26	99.0	33.7	12.77	9.42	62.5	0.37
97	147.2	7.06	105.0	34.5	12.72	7.63	93.2	0.35
98	146.3	7.67	101.0	34.7	13.81	7.56	79.3	0.29
99	143.4	8.27	101.0	33.1	12.66	8.41	65.0	0.19
100	146.9	9.03	105.0	29.3	13.25	11.59	90.2	0.21
Mean	145.7	7.90	102.2	33.5	12.84	8.59	78.6	0.28
S.D.	1.07	0.67	1.99	1.91	0.48	1.40	15.66	0.07

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

FEMALES

Day of Test 43

ANIMAL NUMBER	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
Group III 125 mg/kg/day								
151	148.5	5.78	102.0	37.6	12.47	7.41	87.2	0.27
152	144.8	6.01	102.0	30.9	12.59	7.00	67.7	0.27
153	145.8	7.95	103.0	35.9	12.44	8.38	64.9	0.38
154	148.5	8.85	102.0	30.3	12.79	10.58	73.3	0.19
155	147.4	5.94	98.0	38.7	13.11	9.39	78.4	0.32
156	147.9	5.47	98.0	34.6	13.32	7.65	93.9	0.33
157	145.3	7.53	100.0	36.4	12.53	9.22	75.8	0.26
158	147.0	7.85	104.0	33.3	12.99	8.18	81.3	0.18
159	145.8	6.01	104.0	34.1	13.01	7.80	87.8	0.19
160	149.0	5.30	101.0	36.3	13.37	5.88	109.6	0.22
Mean	147.0	6.67	101.4	34.8	12.86	8.15	82.0	0.26
S.D.	1.49	1.25	2.17	2.73	0.35	1.33	13.29	0.07
Group IV 500 mg/kg/day								
211	146.2	6.24	103.0	36.1	11.59	6.80	63.3	0.25
212	145.8	7.20	102.0	33.4	12.37	8.36	82.0	0.18
213	148.3	7.65	103.0	34.5	14.03	10.64	79.3	0.36
214	148.9	6.14	102.0	28.4	12.96	8.98	83.1	0.27
215	146.2	8.37	100.0	38.3	12.76	11.51	79.6	0.34
216	143.7	10.33	103.0	30.2	13.93	11.82	88.2	0.24
217	148.3	4.65	103.0	35.1	12.30	6.95	80.0	0.20
218	146.7	5.12	102.0	35.8	12.71	5.63	73.9	0.32
219	147.5	8.61	106.0	33.4	13.09	9.35	59.0	0.21
220	147.2	6.74	104.0	32.3	13.03	8.79	69.3	0.25
Mean	146.9	7.11	102.8	33.8	12.88	8.88	75.8	0.26
S.D.	1.52	1.71	1.55	2.91	0.73	2.05	9.27	0.06

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test 92

ANIMAL NUMBER	GLUC mg/dl	BUN mg/dl	A/G	TP g/dl	ALB g/dl	ALK		GLOB g/dl	CREAT mg/dl
						PHOS U/l	SGOT U/l		

Group I 0 mg/kg/day

11	331.7	18.7	1.11	7.11	3.74	113.7	47.1	32.4	3.37	0.9
12	367.6	20.0	1.08	7.23	3.76	190.1	63.1	35.9	3.47	0.8
13	312.7	16.3	0.93	7.36	3.54	91.5	42.9	37.4	3.82	0.7
14	318.9	19.0	0.98	7.48	3.71	97.7	51.8	35.9	3.77	0.7
15	349.7	23.4	1.02	7.28	3.68	133.9	56.0	32.3	3.60	0.8
16	248.6	16.5	0.96	7.83	3.84	87.3	47.0	30.1	3.99	0.8
17	268.8	19.8	0.98	7.14	3.53	63.0	42.6	27.3	3.61	0.7
18	277.2	17.3	0.97	6.83	3.37	177.5	58.3	44.7	3.46	0.7
19	306.7	18.2	0.98	7.19	3.56	82.8	41.5	32.0	3.63	0.6
20	350.4	22.2	1.04	6.92	3.52	154.3	47.2	34.1	3.40	0.7
Mean	313.2	19.1	1.01	7.24	3.63	119.2	49.8	34.2	3.61	0.74
S.D.	38.78	2.31	0.06	0.28	0.14	42.99	7.32	4.74	0.20	0.08

Group II 30 mg/kg/day

71	264.9	19.6	1.04	7.37	3.75	98.6	42.1	30.8	3.62	0.7
72	326.0	18.9	1.00	6.97	3.48	114.6	38.8	26.2	3.49	0.7
73	176.4	18.1	0.96	7.32	3.58	128.4	43.7	28.2	3.74	0.8
74	281.9	15.8	1.01	6.68	3.36	89.5	56.1	44.1	3.32	0.7
75	413.2	18.0	0.97	7.46	3.67	154.5	46.0	32.1	3.79	0.7
76	283.7	23.7	0.95	7.11	3.46	124.8	50.1	36.4	3.65	0.8
77	283.5	18.5	0.90	7.51	3.55	80.3	40.4	25.1	3.96	0.7
78	285.6	17.0	1.01	6.86	3.45	63.0	47.2	36.9	3.41	0.6
79	239.8	19.5	1.01	7.16	3.59	135.1	46.3	28.8	3.57	0.7
80	273.5	20.1	1.09	6.84	3.57	131.3	76.9	63.2	3.27	0.7
Mean	282.9	18.9	0.99	7.13	3.55	112.0	48.8	35.2	3.58	0.71
S.D.	60.05	2.11	0.05	0.29	0.11	28.37	11.07	11.40	0.22	0.06

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test 92

ANIMAL NUMBER	GLUC mg/dl	BUN mg/dl	A/G	TP g/dl	ALB g/dl	ALK				GLOB g/dl	CREAT mg/dl
						PHOS U/l	SGOT U/l	SGPT U/l			

Group III 125 mg/kg/day

131	335.8	14.1	1.00	7.29	3.64	76.2	40.7	34.2	3.65	0.6
132	334.1	19.0	0.94	6.63	3.22	75.9	47.9	28.4	3.41	0.7
134	337.9	19.7	0.83	7.91	3.58	68.0	59.8	41.1	4.33	0.7
135	186.9	17.7	0.85	6.80	3.12	141.1	53.5	43.3	3.68	0.6
136	215.1	16.4	1.18	7.10	3.85	99.9	59.2	43.3	3.25	0.7
137	288.2	18.1	1.09	6.91	3.60	75.5	43.4	26.7	3.31	0.6
138	277.3	17.2	1.00	7.09	3.54	76.2	53.4	37.8	3.55	0.8
139	341.2	19.3	0.85	7.89	3.62	159.3	55.2	45.2	4.27	0.7
140	233.9	20.3	0.95	7.10	3.46	72.8	43.1	28.6	3.64	0.7
141	316.0	15.9	1.01	6.89	3.46	82.7	46.0	29.6	3.43	0.7
Mean	286.6	17.8	0.97	7.16	3.51	92.8	50.2	35.8	3.65	0.68
S.D.	56.84	1.92	0.11	0.43	0.21	31.73	6.91	7.18	0.37	0.06

Group IV 500 mg/kg/day

191	275.0	18.4	1.00	6.93	3.46	125.1	80.2	63.1	3.47	0.7
192	200.6	17.8	1.08	7.76	4.03	115.8	51.0	32.0	3.73	0.6
193	408.5	18.4	1.10	7.05	3.69	78.4	50.0	37.2	3.36	0.8
194	257.2	20.7	0.96	6.75	3.31	70.4	48.1	30.5	3.44	0.7
195	346.7	21.2	1.06	7.20	3.71	174.4	50.1	42.5	3.49	0.7
196	263.0	17.7	1.06	6.81	3.51	121.3	48.0	36.3	3.30	0.8
197	288.8	18.3	0.88	6.76	3.16	139.0	41.0	35.4	3.60	0.6
198	239.5	17.4	1.02	7.53	3.81	164.3	52.5	38.6	3.72	0.7
199	229.8	16.0	1.01	6.45	3.24	95.4	50.1	41.7	3.21	0.6
200	390.8	22.2	0.89	7.92	3.72	75.9	59.4	32.9	4.20	0.8
Mean	290.0	18.8	1.01	7.12	3.56	116.0	53.0	39.0	3.55	0.70
S.D.	69.61	1.93	0.08	0.48	0.28	36.38	10.56	9.32	0.28	0.08

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006		FEMALES						Day of Test 92			
ANIMAL NUMBER	GLUC	BUN	A/G	TP	ALB	ALK	PHOS	SGOT	SGPT	GLOB	CREAT
	mg/dl	mg/dl		g/dl	g/dl	U/l	U/l	U/l	U/l	g/dl	mg/dl
Group I 0 mg/kg/day											
41	217.4	15.6	1.26	7.60	4.24	76.7	53.2	38.6	3.36	0.7	
42	251.5	12.7	1.21	7.64	4.19	46.4	39.5	25.7	3.45	0.6	
43	263.9	18.6	1.18	7.60	4.11	73.2	46.9	30.4	3.49	0.8	
44	262.3	23.8	1.11	8.66	4.56	59.2	47.1	36.4	4.10	0.8	
45	496.1	18.4	1.12	8.10	4.28	79.4	51.6	31.9	3.82	0.9	
46	183.9	24.1	1.18	7.20	3.89	160.1	55.3	41.2	3.31	0.7	
47	264.5	16.9	0.99	7.61	3.79	65.1	93.8	76.6	3.82	0.7	
48	246.2	14.7	1.05	7.53	3.85	37.8	42.1	32.8	3.68	0.7	
49	194.1	15.9	1.07	8.94	4.63	46.0	94.3	96.1	4.31	0.6	
50	224.6	14.3	1.11	6.75	3.55	73.7	63.4	50.6	3.20	0.8	
Mean	260.5	17.5	1.13	7.76	4.11	71.8	58.7	46.0	3.65	0.73	
S.D.	87.72	3.84	0.08	0.65	0.34	34.25	19.81	22.77	0.36	0.09	
Group II 30 mg/kg/day											
101	248.9	15.9	1.03	8.67	4.39	58.1	42.5	42.5	4.28	0.6	
102	380.0	25.3	1.03	8.04	4.07	82.0	50.5	30.6	3.97	1.1	
103	246.0	18.7	1.16	8.57	4.60	55.5	129.4	124.5	3.97	0.7	
104	301.1	14.6	1.22	7.28	4.00	54.6	51.0	30.1	3.28	0.8	
105	298.6	15.6	1.14	7.37	3.92	108.2	49.6	32.4	3.45	0.7	
106	281.4	22.8	1.02	8.30	4.20	97.4	52.1	36.2	4.10	0.8	
107	341.3	18.8	0.78	8.02	3.51	63.5	45.1	32.9	4.51	0.7	
108	287.8	14.3	1.08	7.62	3.95	100.4	73.6	44.6	3.67	0.7	
109	231.3	18.2	1.04	8.04	4.10	114.0	51.0	41.1	3.94	0.7	
110	216.0	17.3	0.94	8.06	3.90	97.8	65.6	55.7	4.16	0.7	
Mean	283.2	18.2	1.04	8.00	4.06	83.2	61.0	47.1	3.93	0.75	
S.D.	50.66	3.55	0.12	0.46	0.30	23.31	25.76	28.34	0.37	0.14	

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

FEMALES

Day of Test 92

ANIMAL NUMBER	GLUC mg/dl	BUN mg/dl	A/G	TP g/dl	ALB g/dl	PHOS U/l	ALK		GLOB g/dl	CREAT mg/dl
							SGOT U/l	SGPT U/l		

Group III 125 mg/kg/day

161	300.2	13.8	1.09	7.78	4.05	42.0	72.9	49.2	3.73	0.8
162	272.3	14.5	1.15	7.95	4.25	78.3	78.3	44.6	3.70	0.8
163	276.8	18.9	1.04	7.43	3.79	117.6	45.4	33.9	3.64	0.7
164	296.8	16.2	1.11	7.96	4.19	72.6	62.6	32.2	3.77	0.7
165	241.9	18.6	1.06	7.32	3.76	91.1	54.7	40.6	3.56	0.6
166	212.5	13.9	1.10	7.45	3.90	97.9	47.7	34.1	3.55	0.7
167	252.8	20.9	0.96	7.82	3.83	78.1	57.5	58.4	3.99	0.7
168	279.5	20.3	1.03	7.44	3.77	88.1	63.6	36.7	3.67	0.6
169	291.6	21.6	1.06	7.43	3.83	133.3	75.8	66.1	3.60	0.7
170	303.5	19.6	1.03	7.60	3.86	123.8	53.4	34.7	3.74	0.8
Mean	272.8	17.8	1.06	7.62	3.92	92.3	61.2	43.1	3.70	0.71
S.D.	29.20	2.98	0.05	0.24	0.18	27.24	11.54	11.57	0.13	0.07

Group IV 500 mg/kg/day

221	220.6	19.3	1.03	7.47	3.79	42.5	53.2	28.6	3.68	0.8
222	283.6	19.1	1.04	7.50	3.83	128.4	43.4	26.1	3.67	0.7
223	265.9	13.0	1.09	7.06	3.68	43.8	56.2	30.5	3.38	0.7
225	323.4	17.8	1.13	7.15	3.79	40.3	55.7	34.1	3.36	0.8
226	240.0	15.6	1.06	9.48	4.87	81.3	347.2	158.7	4.61	0.7
227	274.2	16.1	1.06	7.62	3.92	38.7	54.9	38.0	3.70	0.7
228	288.7	17.8	1.03	7.80	3.96	96.9	48.4	41.7	3.84	0.7
229	314.4	18.1	1.11	8.13	4.27	37.8	42.1	27.6	3.86	0.9
230	258.3	17.8	1.21	7.14	3.91	93.2	40.4	28.6	3.23	0.7
231	237.3	18.7	1.19	8.37	4.54	125.7	44.0	35.4	3.83	0.7
Mean	270.6	17.3	1.10	7.77	4.06	72.9	78.6	44.9	3.72	0.74
S.D.	33.22	1.93	0.06	0.74	0.38	36.76	94.59	40.29	0.38	0.07

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

MALES

Day of Test 92

ANIMAL NUMBER	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
Group I		0 mg/kg/day						
11	148.9	8.27	103.0	34.0	14.40	9.39	97.8	0.24
12	149.7	8.86	104.0	28.8	13.93	11.76	67.9	0.24
13	146.3	9.13	98.0	38.1	12.96	9.35	99.7	0.22
14	146.8	8.27	100.0	35.5	13.47	8.21	80.5	0.19
15	145.6	9.00	99.0	36.7	13.78	10.09	92.2	0.31
16	146.7	8.16	97.0	36.3	13.36	8.92	131.6	0.34
17	147.2	7.41	102.0	34.7	13.12	7.98	121.9	0.38
18	148.9	4.77	100.0	38.2	12.00	5.69	82.8	0.10
19	146.8	7.16	99.0	35.8	12.50	7.50	88.3	0.23
20	146.8	8.62	102.0	34.5	13.17	8.48	97.8	0.24
Mean	147.4	7.97	100.4	35.3	13.27	8.74	96.1	0.25
S.D.	1.33	1.29	2.27	2.68	0.70	1.62	18.96	0.08
Group II		30 mg/kg/day						
71	147.7	7.71	101.0	34.6	13.89	9.33	96.8	0.25
72	147.5	8.49	102.0	36.7	13.74	9.44	85.0	0.23
73	147.7	7.83	98.0	37.3	13.30	10.91	84.5	0.20
74	149.9	5.51	101.0	36.7	12.39	7.90	95.0	0.22
75	146.0	10.51	100.0	36.4	14.78	11.94	80.9	0.28
76	146.1	7.70	101.0	38.4	13.09	8.17	80.4	0.22
77	145.6	8.20	97.0	36.8	13.68	9.43	108.1	0.31
78	148.8	6.94	97.0	41.9	13.48	10.12	94.7	0.21
79	149.1	5.35	97.0	39.6	12.50	7.37	90.6	0.20
80	145.0	10.73	101.0	35.0	12.44	8.98	77.8	0.21
Mean	147.3	7.90	99.5	37.3	13.33	9.36	89.4	0.23
S.D.	1.63	1.78	2.01	2.16	0.76	1.39	9.41	0.04

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006 MALES Day of Test 92

ANIMAL NUMBER	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl

Group III 125 mg/kg/day

131	146.5	6.85	98.0	35.4	12.61	7.66	82.4	0.18
132	145.9	8.13	102.0	37.4	12.88	7.56	97.1	0.14
134	146.0	7.84	99.0	32.8	13.16	7.66	112.5	0.18
135	149.0	5.99	100.0	37.7	12.47	8.63	92.0	0.17
136	149.5	7.37	99.0	36.2	13.66	10.87	98.9	0.30
137	149.9	8.17	101.0	37.5	13.56	9.96	97.0	0.22
138	149.8	6.91	102.0	33.6	12.46	7.79	75.9	0.16
139	146.3	6.56	99.0	34.1	13.84	7.55	119.7	0.26
140	146.1	8.13	99.0	36.3	12.64	7.33	82.6	0.23
141	147.3	8.72	101.0	35.2	12.90	6.92	62.5	0.11
Mean	147.6	7.47	100.0	35.6	13.02	8.19	92.1	0.20
S.D.	1.71	0.87	1.41	1.71	0.51	1.26	16.98	0.06

Group IV 500 mg/kg/day

191	148.1	7.46	102.0	34.9	13.20	8.43	80.0	0.19
192					12.30	6.61	110.1	0.26
193	147.5	8.02	101.0	34.2	13.49	6.80	102.4	0.17
194	148.7	7.67	100.0	38.5	12.61	9.93	98.6	0.13
195	148.2	8.97	100.0	35.2	13.21	9.14	83.4	0.29
196	148.1	6.81	98.0	39.0	12.29	8.05	92.1	0.14
197	146.3	7.99	101.0	37.6	11.48	7.73	86.3	0.14
198	147.3	8.04	100.0	35.2	13.40	10.54	101.7	0.23
199	148.8	6.30	102.0	39.9	12.59	8.67	54.0	0.19
200	146.8	5.52	99.0	35.4	13.54	7.31	123.3	0.27
207 <sup>a</sup>	146.7	8.29	99.0	37.6				
Mean	147.7	7.51	100.2	36.8	12.81	8.32	93.2	0.20
S.D.	0.86	1.02	1.32	2.00	0.67	1.29	18.95	0.06

<sup>a</sup> substituted #207 for #192

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006		FEMALES				Day of Test	92		
ANIMAL NUMBER		Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
		meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl
Group I		0 mg/kg/day							
41		144.1	8.35	99.0	34.5	13.12	9.38	98.6	0.21
42		145.2	7.88	101.0	30.3	12.89	9.52	101.1	0.17
43		146.0	8.10	98.0	33.4	12.77	7.01	98.9	0.20
44		143.1	8.44	98.0	33.4	14.21	7.53	107.6	0.23
45		146.0	10.59	98.0	20.8	14.86	16.84	93.6	0.24
46		147.5	8.16	105.0	36.5	13.66	7.95	87.9	0.25
47		146.1	8.69	100.0	31.1	13.10	7.85	112.3	0.31
48		147.2	7.42	101.0	32.8	13.28	8.00	111.7	0.17
49		146.9	6.40	99.0	35.6	13.58	7.66	141.3	0.20
50		146.8	7.95	102.0	34.4	12.63	6.99	93.4	0.14
Mean		145.9	8.20	100.1	32.3	13.41	8.87	104.6	0.21
S.D.		1.40	1.06	2.23	4.45	0.69	2.93	15.17	0.05
Group II		30 mg/kg/day							
101		146.8	6.70	101.0	38.0	13.52	5.44	80.9	0.23
102		147.7	7.75	102.0	28.6	13.89	7.01	104.8	0.20
103		148.4	5.68	99.0	36.4	12.91	6.08	123.5	0.18
104		147.0	7.33	99.0	36.3	13.26	7.51	85.0	0.16
105		145.8	7.28	100.0	35.9	12.97	7.36	90.0	0.18
106		144.6	8.90	100.0	33.0	13.75	8.58	96.8	0.13
107		144.8	7.93	98.0	34.2	12.78	7.97	108.9	0.19
108		147.1	8.37	102.0	30.4	12.74	8.59	99.9	0.19
109		144.0	7.78	98.0	36.6	13.10	6.61	103.7	0.24
110		144.3	7.45	101.0	33.0	12.93	7.60	94.4	0.17
Mean		146.1	7.52	100.0	34.2	13.19	7.28	98.8	0.19
S.D.		1.56	0.89	1.49	3.00	0.41	1.02	12.41	0.03

Table 6 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Serum Chemistry Values

TRL Study #032-006

FEMALES

Day of Test

92

ANIMAL NUMBER	Na	K	Cl	TCO <sub>2</sub>	Ca	PHOS	CHOL	TOTL BILI
	meq/l	meq/l	mmol/l	mmol/l	mg/dl	mg/dl	mg/dl	mg/dl

Group III 125 mg/kg/day

161	146.4	8.31	102.0	33.6	13.02	7.42	89.0	0.26
162	148.4	6.84	103.0	32.3	13.83	7.78	112.0	0.13
163	147.8	6.91	102.0	33.4	12.94	5.86	80.5	0.18
164	146.7	8.00	99.0	28.0	13.47	9.86	102.5	0.19
165	145.7	8.15	100.0	32.7	13.52	9.47	117.6	0.17
166	149.6	5.48	100.0	38.1	12.00	7.03	76.3	0.17
167	144.4	7.90	101.0	32.5	12.82	6.45	91.5	0.12
168	144.0	8.14	101.0	29.1	12.26	7.13	95.0	0.20
169	145.5	7.59	101.0	37.8	13.50	7.32	104.3	0.22
170	146.1	6.67	103.0	35.1	13.20	6.09	130.8	0.27
Mean	146.5	7.40	101.2	33.3	13.06	7.44	100.0	0.19
S.D.	1.74	0.90	1.32	3.24	0.58	1.32	16.96	0.05

Group IV 500 mg/kg/day

221	145.2	7.55	103.0	31.8	12.29	7.24	72.8	0.14
222	145.0	6.55	100.0	39.4	13.24	6.96	84.4	0.21
223	145.7	8.32	100.0	36.3	12.95	8.39	88.6	0.22
225	146.0	8.11	102.0	33.2	13.06	7.96	95.4	0.11
226	145.2	6.90	97.0	34.4	14.32	6.58	141.7	0.26
227	147.4	8.72	103.0	34.0	13.82	7.84	89.4	0.15
228	147.2	5.38	98.0	34.7	12.62	4.53	102.6	0.16
229	146.3	8.83	102.0	27.2	14.17	11.10	118.9	0.12
230	147.3	7.27	103.0	33.1	13.24	7.81	62.9	0.23
231	146.6	7.45	100.0	32.1	14.69	10.55	129.9	0.22
Mean	146.2	7.51	100.8	33.6	13.44	7.90	98.7	0.18
S.D.	0.92	1.06	2.15	3.16	0.78	1.88	24.95	0.05

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

MALES

Day of Test -4

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group V      Baseline

241	1.014	7.0
242	1.016	6.5
243	1.009	7.0
244	1.018	6.0
245	1.010	7.0
246	1.007	6.5
247	1.005	7.0
248	1.007	7.0
249	1.010	7.0
250	1.010	7.5
Mean	1.011	6.9
S.D.	0.004	0.41

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006                    FEMALES                    Day of Test -4

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group V                    Baseline

251	1.008	7.0
252	1.005	7.5
253	1.009	7.5
254	1.010	7.0
255	1.007	7.5
256	1.010	7.0
257	1.007	7.0
258	1.007	8.0
259	1.005	7.0
260	1.014	8.0
Mean	1.008	7.4
S.D.	0.003	0.41

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

MALES

Day of Test 39

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group I 0 mg/kg/day

1	1.019	9.0
2	1.012	8.0
3	1.010	8.0
4	1.022	8.0
5	1.007	8.5
6	1.027	8.5
7	1.011	8.0
8	1.009	8.0
9	1.014	9.0
10	1.007	8.0
Mean	1.014	8.3
S.D.	0.007	0.42

Group II 30 mg/kg/day

61	1.011	9.0
62	1.019	8.5
63	1.029	8.5
64	1.030	8.5
65	1.023	8.5
66	1.012	9.0
67	1.009	9.0
68	1.010	9.0
69	1.014	9.0
70	1.008	8.5
Mean	1.017	8.8*
S.D.	0.008	0.26

\* P less than or equal to 0.05

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

MALES

Day of Test 39

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group III 125 mg/kg/day

121	1.015	8.0
122	1.009	8.5
123	1.011	8.5
124	1.042	8.0
125	1.012	9.0
126	1.011	8.0
127	1.027	8.5
128	1.017	9.0
129	1.009	9.0
130	1.011	8.5
Mean	1.016	8.5
S.D.	0.010	0.41

Group IV 500 mg/kg/day

181	1.005	8.0
182	1.009	8.5
183	1.006	8.0
184	1.011	9.0
185	1.023	9.0
186	1.017	9.0
187	1.016	8.5
188	1.008	8.0
189	1.010	8.5
190	1.010	9.0
Mean	1.012	8.6
S.D.	0.006	0.44

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

FEMALES

Day of Test 39

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group I 0 mg/kg/day

31	1.005	8.5
32	1.007	8.5
33	1.010	8.0
34	1.006	8.5
35	1.013	9.0
36	1.011	8.0
37	1.005	9.0
38	1.014	9.0
39	1.007	8.5
40	1.012	8.5
Mean	1.009	8.6
S.D.	0.003	0.37

Group II 30 mg/kg/day

91	1.010	9.0
92	1.011	9.0
93	1.010	9.0
94	1.014	9.0
95	1.012	9.0
96	1.010	9.0
97	1.013	8.0
98	1.010	9.0
99	1.009	8.5
100	1.006	9.0
Mean	1.011	8.9
S.D.	0.002	0.34

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

FEMALES

Day of Test 39

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group III 125 mg/kg/day

151	1.006	8.0
152	1.004	8.0
153	1.016	8.5
154	1.005	8.5
155	1.014	8.5
156	1.015	9.0
157	1.005	8.5
158	1.007	8.0
159	1.022	9.0
160	1.010	9.0
Mean	1.010	8.5
S.D.	0.006	0.41

Group IV 500 mg/kg/day

211	1.012	9.0
212	1.011	8.0
213	1.008	9.0
214	1.005	7.5
215	1.015	9.0
216	1.007	8.5
217	1.010	9.0
218	1.009	9.0
219	1.011	8.5
220	1.012	8.5
Mean	1.010	8.6
S.D.	0.003	0.52

Table I (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

FEMALES

Day of Test 88

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group III 125 mg/kg/day

161	1.010	9.0
162	1.008	9.0
163	1.005	7.5
164	1.005	7.5
165	1.005	7.5
166	1.004	7.0
167	1.007	8.0
168	1.023	5.5
169	1.018	5.5
170	1.008	8.5
Mean	1.009	7.5
S.D.	0.006	1.25

Group IV 500 mg/kg/day

221	1.006	8.0
222	1.013	5.5
223	1.006	8.0
225	1.008	8.0
226	1.006	7.5
227	1.008	8.0
228	1.013	9.0
229	1.005	7.5
230	1.010	7.5
231	1.004	6.5
Mean	1.008	7.6
S.D.	0.003	0.96

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

FEMALES

Day of Test 88

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group I 0 mg/kg/day

41	1.004	7.0
42	1.010	7.0
43	1.012	7.5
44	1.005	7.0
45	1.004	8.0
46	1.006	6.5
47	1.004	6.0
48	1.005	7.0
49	1.005	6.5
50	1.008	6.5
Mean	1.006	6.9
S.D.	0.003	0.57

Group II 30 mg/kg/day

101	1.006	7.0
102	1.006	8.0
103	1.008	7.0
104	1.007	7.5
105	1.006	7.5
106	1.008	8.0
107	1.005	7.5
108	1.007	8.0
109	1.005	8.0
110	1.006	8.0
Mean	1.006	7.7*
S.D.	0.001	0.41

\* P less than or equal to 0.05

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

MALES

Day of Test 88

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group III 125 mg/kg/day

131	1.026	9.0
132	1.006	8.5
134	1.027	9.0
135	1.021	9.0
136	1.032	8.0
137	1.016	8.5
138	1.006	8.0
139	1.016	9.0
140	1.023	9.0
141	1.011	8.5
Mean	1.018	8.7
S.D.	0.009	0.41

Group IV 500 mg/kg/day

191	1.026	8.0
192	1.023	9.0
193	1.007	9.0
194	1.006	8.5
195	1.006	8.5
196	1.007	7.5
197	1.009	8.5
198	1.022	8.0
199	1.021	7.5
200	1.040	9.0
Mean	1.017	8.4
S.D.	0.012	0.58

Table 7 (cont'd.)

Rat Oral Subchronic Toxicity Study of Normal Butanol

Urinalysis Values

TRL Study #032-006

MALES

Day of Test 88

ANIMAL NUMBER	SPECIFIC GRAVITY	pH
------------------	---------------------	----

Group I 0 mg/kg/day

11	1.024	8.0
12	1.008	8.5
13	1.025	8.0
14	1.022	7.5
15	1.014	9.0
16	1.023	7.5
17	1.014	8.5
18	1.010	9.0
19	1.025	8.5
20	1.029	8.5
Mean	1.019	8.3
S.D.	0.007	0.54

Group II 30 mg/kg/day

71	1.012	8.5
72	1.028	8.0
73	1.016	8.0
74	1.011	8.5
75	1.020	8.5
76	1.006	8.0
77	1.010	7.5
78	1.012	8.5
79	1.010	9.0
80	1.020	8.5
Mean	1.015	8.3
S.D.	0.007	0.42

Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Urinalysis Values**

TRL Study #032-006

Day of Test -4Group V 0 mg/kg/day (baseline)

Animal Number	MALES									
	241	242	243	244	245	246	247	248	249	250
Specific Gravity	1.014	1.016	1.009	1.018	1.010	1.007	1.005	1.007	1.010	1.010
pH	7.0	6.5	7.0	6.0	7.0	6.5	7.0	7.0	7.0	7.5
Protein: Chemstrip Supernatant	0	0	0	0	0	0	0	0	0	0
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	50	0	0	0	0	0	0
Leukocytes	0	0	0	trace	0	0	0	0	0	0
Nitrite	0	0	0	positive	0	positive	0	0	0	0
Casts/LPF	--	--	--	0	--	0	--	--	--	--
Epith. Cells/LPF	--	--	--	0	--	0	--	--	--	--
Phos. Cryst./LPF	--	--	--	0	--	0	--	--	--	--
Other Cryst./LPF	--	--	--	0	--	0	--	--	--	--
RBC/HPF	--	--	--	0	--	0	--	--	--	--
WBC/HPF	--	--	--	0	--	0	--	--	--	--
Yeast/HPF	--	--	--	0	--	0	--	--	--	--
Bacteria	--	--	--	0	--	0	--	--	--	--

Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values**

TRL Study #032-006

Day of Test -4Group V 0 mg/kg/day (baseline)**FEMALES**

Animal Number	251	252	253	254	255	256	257	258	259	260
Specific Gravity	1.008	1.005	1.009	1.010	1.007	1.010	1.007	1.007	1.005	1.014
pH	7.0	7.5	7.5	7.0	7.5	7.0	7.0	8.0	7.0	8.0
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	0	0	0	0	0	0	0
Leukocytes	0	0	0	0	0	0	0	0	0	0
Nitrite	0	0	0	0	0	0	0	0	0	0
Casts/LPF	--	--	--	--	--	--	--	--	--	--
Epith. Cells/LPF	--	--	--	--	--	--	--	--	--	--
Phos. Cryst./LPF	--	--	--	--	--	--	--	--	--	--
Other Cryst./LPF	--	--	--	--	--	--	--	--	--	--
RBC/HPF	--	--	--	--	--	--	--	--	--	--
WBC/HPF	--	--	--	--	--	--	--	--	--	--
Yeast/HPF	--	--	--	--	--	--	--	--	--	--
Bacteria	--	--	--	--	--	--	--	--	--	--

Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values

TRL Study #032-006

Day of Test 39Group I 0 mg/kg/day

Animal Number	MALES									
	001	002	003	004	005	006	007	008	009	010
Specific Gravity	1.019	1.012	1.010	1.022	1.007	1.027	1.011	1.009	1.014	1.007
pH	9.0	8.0	8.0	8.0	8.5	8.5	8.0	8.0	9.0	8.0
Protein: Chemstrip	trace	0	0	trace	0	trace	0	0	0	0
Supernatant	trace	--	--	trace	--	trace	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	1+	0	1+	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	10	0	10	0	0	0	0	10	10	0
Leukocytes	1+	trace	1+	trace	0	trace	0	trace	0	0
Nitrite	0	0	0	0	0	0	0	0	0	0
Casts/LPF	0	0	0	0	--	0	--	0	0	--
Epith. Cells/LPF	0	0	0	0	--	0	--	0	0	--
Phos. Cryst./LPF	5	0	0	8	--	130	--	0	0	--
Other Cryst./LPF	0	0	0	0	--	0	--	0	0	--
RBC/LPF	0	0	0	0	--	0	--	0	0	--
WBC/LPF	0	0	0	0	--	0	--	0	0	--
Yeast/LPF	0	0	0	0	--	0	--	0	0	--
Bacteria	0	0	0	1+	--	0	--	0	1+	--

Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values

TRL Study #032-006

Day of Test 39Group II 30 mg/kg/day

## MALES

Animal Number	061	062	063	064	065	066	067	068	069	070
Specific Gravity	1.011	1.019	1.029	1.030	1.023	1.012	1.009	1.010	1.014	1.008
pH	9.0	8.5	8.5	8.5	8.5	9.0	9.0	9.0	9.0	8.5
Protein: Chemstrip	0	trace	0	1+	0	1+	0	0	trace	0
Supernatant	--	trace	--	1+	--	trace	--	--	trace	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	1+	1+	1+	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	10	10	0	0	10	50	0	0	0	0
Leukocytes	trace	trace	trace	trace	trace	1+	0	0	0	0
Nitrite	0	positive	0	0	0	0	0	positive	positive	0
Casts/LPF	0	0	0	0	0	0	--	0	0	--
Epith. Cells/LPF	0	0	0	0	0	0	--	0	0	--
Phos. Cryst./LPF	0	300	35	8	10	0	--	0	70	--
Other Cryst./LPF	0	0	0	0	0	0	--	0	0	--
RBC/HPF	0	0	0	0	0	0	--	0	0	--
WBC/HPF	0	2	0	0	0	0	--	0	0	--
Yeast/HPF	0	0	0	0	0	0	--	0	0	--
Bacteria	0	1+	0	0	0	0	--	1+	0	--

Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values

TRL Study #032-006

Day of Test 39Group III 125 mg/kg/day

## MALES

Animal Number	121	122	123	124	125	126	127	128	129	130
Specific Gravity	1.015	1.009	1.011	1.042	1.012	1.011	1.027	1.017	1.009	1.011
pH	8.0	8.5	8.5	8.0	9.0	8.0	8.5	9.0	9.0	8.5
Protein: Chemstrip	0	0	0	trace	0	0	0	1+	trace	0
Supernatant	--	--	--	1+	--	--	--	trace	0	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	1+	0	0	1+	1+	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	10	0	0	0	10	0	0
Leukocytes	trace	0	0	1+	0	trace	trace	trace	0	0
Nitrite	positive	0	0	0	0	0	positive	positive	positive	0
Casts/LPF	0	--	--	0	--	0	0	0	0	--
Epith. Cells/LPF	0	--	--	0	--	0	0	0	0	--
Phos. Cryst./LPF	0	--	--	120	--	0	350	80	0	--
Other Cryst./LPF	0	--	--	0	--	0	0	0	0	--
RBC/HPF	0	--	--	0	--	0	0	0	0	--
WBC/HPF	0	--	--	0	--	0	0	0	0	--
Yeast/HPF	0	--	--	0	--	0	0	0	0	--
Bacteria	1+	--	--	0	--	0	0	0	1+	--

Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Urinalysis Values**

TRL Study #032-006

Day of Test 39Group IV 500 mg/kg/day

Animal Number	MALES									
	181	182	183	184	185	186	187	188	189	190
Specific Gravity	1.005	1.009	1.006	1.011	1.023	1.017	1.016	1.008	1.010	1.010
pH	8.0	8.5	8.0	9.0	9.0	9.0	8.5	8.0	8.5	9.0
Protein: Chemstrip	0	0	0	0	trace	0	0	0	0	1+
Supernatant	--	--	--	--	0	--	--	--	--	0
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	1+	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	10	0	10	0	0	10	0	0
Leukocytes	0	0	trace	0	trace	trace	trace	trace	0	0
Nitrite	0	0	0	positive	0	0	0	0	0	positive
Casts/LPF	--	--	0	0	0	0	0	0	--	0
Epith. Cells/LPF	--	--	5	0	0	0	0	0	--	0
Phos. Cryst./LPF	--	--	0	10	10	15	5	0	--	0
Other Cryst./LPF	--	--	0	0	0	0	0	0	--	0
RBC/HPF	--	--	0	0	0	0	0	2	--	0
WBC/HPF	--	--	2	0	0	0	0	2	--	0
Yeast/HPF	--	--	0	0	0	0	0	0	--	0
Bacteria	--	--	1+	1+	0	0	0	0	--	1+

Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Urinalysis Values**

TRL Study #032-006

Day of Test 40Group I 0 mg/kg/day**FEMALES**

Animal Number	031	032	033	034	035	036	037	038	039	040
Specific Gravity	1.005	1.007	1.010	1.006	1.013	1.011	1.005	1.014	1.007	1.012
pH	8.5	8.5	8.0	8.5	9.0	8.0	9.0	9.0	8.5	8.5
Protein: Chemstrip Supernatant	0	0	0	0	0	0	0	0	0	0
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	0	0	10	0	0	0	0
Leukocytes	0	0	0	0	0	0	0	0	0	0
Nitrite	positive	positive	positive	positive	positive	0	positive	positive	positive	0
Casts/LPF	0	0	0	0	0	0	0	0	0	--
Epith. Cells/LPF	0	0	0	0	0	0	0	0	0	--
Phos. Cryst./LPF	0	0	0	0	0	0	0	15	0	--
Other Cryst./LPF	0	0	0	0	0	0	0	0	0	--
RBC/HPF	0	0	0	0	0	0	0	0	0	--
WBC/HPF	0	0	0	0	0	0	0	0	0	--
Yeast/HPF	0	0	0	0	0	0	0	0	0	--
Bacteria	0	1+	0	1+	1+	0	0	0	1+	--

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Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values

TRL Study #032-006

Day of Test 40Group II 30 mg/kg/day

Animal Number	FEMALES									
	091	092	093	094	095	096	097	098	099	100
Specific Gravity	1.010	1.011	1.010	1.014	1.012	1.010	1.013	1.010	1.009	1.006
pH	9.0	9.0	9.0	9.0	9.0	9.0	8.0	9.0	8.5	9.0
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	0	0	0	0	0	0	0
Leukocytes	0	0	0	0	0	0	0	0	0	0
Nitrite	0	positive	0	0	0	positive	0	0	0	0
Casts/LPF	--	0	--	--	--	0	--	--	--	--
Epith. Cells/LPF	--	5	--	--	--	0	--	--	--	--
Phos. Cryst./LPF	--	0	--	--	--	0	--	--	--	--
Other Cryst./LPF	--	0	--	--	--	0	--	--	--	--
RBC/HPF	--	0	--	--	--	0	--	--	--	--
WBC/HPF	--	0	--	--	--	0	--	--	--	--
Yeast/HPF	--	0	--	--	--	0	--	--	--	--
Bacteria	--	1+	--	--	--	0	--	--	--	--

Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Urinalysis Values**

TRL Study #032-006

Day of Test 40Group III 125 mg/kg/day**FEMALES**

Animal Number	151	152	153	154	155	156	157	158	159	160
Specific Gravity	1.006	1.004	1.016	1.005	1.014	1.015	1.005	1.007	1.022	1.010
pH	8.0	8.0	8.5	8.5	8.5	9.0	8.5	8.0	9.0	9.0
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	0	0	0	0	0	0	0
Leukocytes	0	0	0	0	0	trace	0	0	0	0
Nitrite	0	0	positive	0	positive	positive	0	0	0	0
Casts/LPF	--	--	0	--	0	0	--	--	--	--
Epith. Cells/LPF	--	--	5	--	0	0	--	--	--	--
Phos. Cryst./LPF	--	--	5	--	0	0	--	--	--	--
Other Cryst./LPF	--	--	0	--	0	0	--	--	--	--
RBC/HPF	--	--	0	--	0	0	--	--	--	--
WBC/HPF	--	--	0	--	0	0	--	--	--	--
Yeast/HPF	--	--	0	--	0	0	--	--	--	--
Bacteria	--	--	1+	--	1+	1+	--	--	--	--

Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Urinalysis Values**

TRL Study #032-006

Day of Test 40Group IV 500 mg/kg/day

## FEMALES

Animal Number	211	212	213	214	215	216	217	218	219	220
Specific Gravity	1.012	1.011	1.008	1.005	1.015	1.007	1.010	1.009	1.011	1.012
pH	9.0	8.0	9.0	7.5	9.0	8.5	9.0	9.0	8.5	8.5
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	0	0	0	0	0	0	0
Leukocytes	0	0	0	0	0	0	0	0	0	0
Nitrite	0	positive	0	positive	0	0	0	0	0	0
Casts/LPF	--	0	--	0	--	--	--	--	--	--
Epith. Cells/LPF	--	0	--	0	--	--	--	--	--	--
Phos. Cryst./LPF	--	0	--	0	--	--	--	--	--	--
Other Cryst./LPF	--	0	--	0	--	--	--	--	--	--
RBC/HPF	--	0	--	0	--	--	--	--	--	--
WBC/HPF	--	0	--	0	--	--	--	--	--	--
Yeast/HPF	--	0	--	0	--	--	--	--	--	--
Bacteria	--	0	--	0	--	--	--	--	--	--

Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values - Final Sacrifice**

TRL Study #032-006

Day of Test 88Group I 0 mg/kg/day

Animal Number	MALES									
	011	012	013	014	015	016	017	018	019	020
Specific Gravity	1.024	1.008	1.025	1.022	1.014	1.023	1.014	1.010	1.025	1.029
pH	8.0	8.5	8.0	7.5	9.0	7.5	8.5	9.0	8.5	8.5
Protein: Chemstrip	2+	0	1+	0	0	trace	0	trace	1+	0
Supernatant	2+	--	1+	--	--	1+	--	trace	1+	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	10	0	10	10	0	10	0
Leukocytes	2+	0	1+	1+	trace	1+	trace	trace	1+	trace
Nitrite	0	0	0	0	positive	0	0	0	0	0
Casts/LPF	0	--	0	0	0	0	0	0	0	0
Epith. Cells/LPF	0	--	0	0	0	0	0	0	0	0
Phos. Cryst./LPF	30	--	25	0	0	0	0	0	20	10
Other Cryst./LPF	0	--	0	0	0	0	0	0	0	0
RBC/HPF	0	--	0	0	0	0	0	0	0	0
WBC/HPF	0	--	0	0	0	0	0	0	0	0
Yeast/HPF	0	--	0	0	0	0	0	0	0	0
Bacteria	0	--	0	1+	0	0	0	0	0	0

Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values - Final Sacrifice

TRL Study #032-006

Day of Test 88Group II 30 mg/kg/day

Animal Number	MALES									
	071	072	073	074	075	076	077	078	079	080
Specific Gravity	1.012	1.028	1.016	1.011	1.020	1.006	1.010	1.012	1.010	1.020
pH	8.5	8.0	8.0	8.5	8.5	8.0	7.5	8.5	9.0	8.5
Protein: Chemstrip	0	0	trace	0	0	0	1+	0	0	0
Supernatant	--	--	1+	--	--	--	1+	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	10	0	10	10	0	0	10	10	0	10
Leukocytes	trace	trace	trace	trace	0	trace	1+	0	0	0
Nitrite	0	0	positive	0	0	positive	positive	positive	0	0
Casts/LPF	0	0	0	0	--	0	0	0	--	0
Epith. Cells/LPF	0	0	0	0	--	0	0	0	--	0
Phos. Cryst./LPF	0	30	0	0	--	0	0	0	--	10
Other Cryst./LPF	0	0	0	0	--	0	0	0	--	0
RBC/HPF	0	0	0	0	--	0	0	0	--	0
WBC/HPF	0	0	0	0	--	0	0	0	--	0
Yeast/HPF	0	0	0	0	--	0	0	0	--	0
Bacteria	0	0	0	0	--	0	1+	1+	--	0

Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values - Final Sacrifice

TRL Study #032-006

Day of Test 88Group III 125 mg/kg/day

## MALES

Animal Number	131	132	134	135	136	137	138	139	140	141
Specific Gravity	1.026	1.006	1.027	1.021	1.032	1.016	1.006	1.016	1.023	1.011
pH	9.0	8.5	9.0	9.0	8.0	8.5	8.0	9.0	9.0	8.5
Protein: Chemstrip	1+	0	1+	trace	0	0	1+	trace	1+	—
Supernatant	1+	--	2+	trace	--	--	trace	1+	trace	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	10	10	10	10	0	0	0	10	10	0
Leukocytes	trace	0	2+	1+	trace	0	0	trace	2+	0
Nitrite	0	positive	0	0	0	0	positive	positive	positive	0
Casts/LPF	0	0	0	0	0	--	0	0	0	--
Epith. Cells/LPF	0	0	0	0	0	--	0	0	0	--
Phos. Cryst./LPF	15	0	0	0	0	--	0	6	0	--
Other Cryst./LPF	0	0	0	0	0	--	0	0	0	--
RBC/LPF	0	0	0	0	0	--	0	0	0	--
WBC/LPF	0	0	0	0	0	--	0	0	0	--
Yeast/LPF	0	0	0	0	0	--	0	0	0	--
Bacteria	0	1+	1+	0	0	--	0	0	0	--

Animal # 133 was found dead; no urinalysis values are available.

Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values - Final Sacrifice

TRL Study #032-006

Day of Test 88Group IV 500 mg/kg/day

Animal Number	MALES									
	191	192	193	194	195	196	197	198	199	200
Specific Gravity	1.026	1.023	1.007	1.006	1.006	1.007	1.009	1.022	1.021	1.040
pH	8.0	9.0	9.0	8.5	8.5	7.5	8.5	8.0	7.5	9.0
Protein: Chemstrip	0	1+	1+	0	0	1+	0	0	0	1+
Supernatant	--	1+	1+	--	--	1+	--	--	--	1+
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	10	0	0	10	0	10	0	10	10	50
Leukocytes	trace	2+	trace	0	0	trace	trace	trace	1+	1+
Nitrite	0	0	positive	0	0	positive	0	0	positive	0
Casts/LPF	0	0	0	0	--	0	0	0	0	0
Epith. Cells/LPF	0	0	0	0	--	0	0	0	0	0
Phos. Cryst./LPF	10	0	0	0	--	0	0	10	50	10
Other Cryst./LPF	0	0	0	0	--	0	0	0	0	0
RBC/HPF	0	0	0	0	--	0	0	0	0	2
WBC/HPF	0	0	0	0	--	0	0	0	0	0
Yeast/HPF	0	0	0	0	--	0	0	0	0	0
Bacteria	0	0	1+	0	--	1+	0	1+	1+	1+

Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values - Final Sacrifice

TRL Study #032-006

Day of Test 88Group I 0 mg/kg/day

Animal Number	FEMALES									
	041	042	043	044	045	046	047	048	049	050
Specific Gravity	1.004	1.010	1.012	1.005	1.004	1.006	1.004	1.005	1.005	1.008
pH	7.0	7.0	7.5	7.0	8.0	6.5	6.0	7.0	6.5	6.5
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	10	0	10	10	0	10	250	0	0
Leukocytes	0	0	0	0	0	0	trace	0	trace	0
Nitrite	0	0	0	0	positive	0	0	0	0	positive
Casts/LPF	--	0	--	0		--	0	0	0	0
Epith. Cells/LPF	--	0	--	0	0	--	0	0	0	0
Phos. Cryst./LPF	--	0	--	0	0	--	0	0	0	0
Other Cryst./LPF	--	0	--	0	0	--	0	0	0	0
RBC/HPF	--	0	--	0	0	--	0	0	0	0
WBC/HPF	--	0	--	0	0	--	0	0	0	0
Yeast/HPF	--	0	--	0	0	--	0	0	0	0
Bacteria	--	1+	--	0	0	--	0	0	0	0

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Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Urinalysis Values - Final Sacrifice**

TRL Study #032-006

Day of Test 88Group II 30 mg/kg/day

## FEMALES

Animal Number	101	102	103	104	105	106	107	108	109	110
Specific Gravity	1.006	1.006	1.008	1.007	1.006	1.008	1.005	1.007	1.005	1.006
pH	7.0	8.0	7.0	7.5	7.5	8.0	7.5	8.0	8.0	8.0
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	10	0	0	0	0	0	0	0	0	0
Leukocytes	trace	0	0	0	0	0	0	0	0	0
Nitrite	positive	0	0	0	0	0	0	0	0	positive
Casts/LPF	0	--	--	--	--	--	--	--	--	0
Epith. Cells/LPF	0	--	--	--	--	--	--	--	--	0
Phos. Cryst./LPF	0	--	--	--	--	--	--	--	--	0
Other Cryst./LPF	0	--	--	--	--	--	--	--	--	0
RBC/HPF	0	--	--	--	--	--	--	--	--	0
WBC/HPF	0	--	--	--	--	--	--	--	--	0
Yeast/HPF	0	--	--	--	--	--	--	--	--	0
Bacteria	0	--	--	--	--	--	--	--	--	0

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Table 7

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Urinalysis Values - Final Sacrifice**

TRL Study #032-006

Day of Test 88Group III 125 mg/kg/day

## FEMALES

Animal Number	161	162	163	164	165	166	167	168	169	170
Specific Gravity	1.010	1.008	1.005	1.005	1.005	1.004	1.007	1.023	1.018	1.008
pH	9.0	9.0	7.5	7.5	7.5	7.0	8.0	5.5	5.5	8.5
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	50	0	0	0	50	10	0	0
Leukocytes	0	0	0	0	0	0	0	0	0	0
Nitrite	0	0	0	0	0	0	0	0	0	0
Casts/LPF	--	--	0	--	--	--	0	0	--	--
Epith. Cells/LPF	--	--	0	--	--	--	0	0	--	--
Phos. Cryst./LPF	--	--	0	--	--	--	0	0	--	--
Other Cryst./LPF	--	--	0	--	--	--	0	0	--	--
RBC/HPF	--	--	0	--	--	--	0	0	--	--
WBC/HPF	--	--	0	--	--	--	0	0	--	--
Yeast/HPF	--	--	0	--	--	--	0	0	--	--
Bacteria	--	--	0	--	--	--	0	0	--	--

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Table 7

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Urinalysis Values - Final Sacrifice

TRL Study #032-006

Day of Test 88Group IV 500 mg/kg/day

## FEMALES

Animal Number	221	222	223	225	226	227	228	229	230	231
Specific Gravity	1.006	1.013	1.006	1.008	1.006	1.008	1.013	1.005	1.010	1.004
pH	8.0	5.5	8.0	8.0	7.5	8.0	9.0	7.5	7.5	6.5
Protein: Chemstrip	0	0	0	0	0	0	0	0	0	0
Supernatant	--	--	--	--	--	--	--	--	--	--
Glucose	0	0	0	0	0	0	0	0	0	0
Ketones	0	0	0	0	0	0	0	0	0	0
Bilirubin	0	0	0	0	0	0	0	0	0	0
Urobilinogen	0	0	0	0	0	0	0	0	0	0
Occult Blood	0	0	0	0	0	0	0	0	0	0
Leukocytes	0	0	0	0	0	0	0	0	0	0
Nitrite	0	0	0	0	0	0	0	0	0	0
Casts/LPF	--	--	--	--	--	--	--	--	--	--
Epith. Cells/LPF	--	--	--	--	--	--	--	--	--	--
Phos. Cryst./LPF	--	--	--	--	--	--	--	--	--	--
Other Cryst./LPF	--	--	--	--	--	--	--	--	--	--
RBC/HPF	--	--	--	--	--	--	--	--	--	--
WBC/HPF	--	--	--	--	--	--	--	--	--	--
Yeast/HPF	--	--	--	--	--	--	--	--	--	--
Bacteria	--	--	--	--	--	--	--	--	--	--

Animal # 224 was found dead; no urinalysis values are available.

Table 8

Rat Oral Subchronic Toxicity Study of Normal Butanol<sup>a</sup>  
Gross Observations at Necropsy - Interim Sacrifice

TRL Study #032-006

Group Dose (mg/kg/day)	MALE				FEMALE			
	I 0	II 30	III 125	IV 500	I 0	II 30	III 125	IV 500
<u>TISSUE</u>								
<u>Lungs</u>								
Left lobe red	--	--	1/11	--	--	--	--	--
Cranial and middle lobes shriveled	--	--	1/11	--	--	--	--	--
<u>Kidney</u>								
Dilated pelvis, one or both	--	--	--	--	1/10	--	--	1/11
<u>Uterine Horns</u>								
Enlarged bilaterally	--	--	--	--	1/10	2/10	1/10	1/11
<u>Epididymis</u>								
Tan raised area	--	1/10	--	--	--	--	--	--

<sup>a</sup> Includes animals found dead before day 43

Table 8

Rat Oral Subchronic Toxicity Study of Normal Butanol<sup>a</sup>  
Gross Observations at Necropsy - Final Sacrifice

TRL Study #032-006

Group Dose (mg/kg/day)	MALE				FEMALE			
	I 0	II 30	III 125	IV 500	I 0	II 30	III 125	IV 500
<u>TISSUE</u>								
<u>LUNGS</u>								
Dark area, caudal lobe	1	1	--	--	--	--	--	--
Dark area, middle lobe	--	--	--	--	--	--	--	1
White areas on edges, all lobes	--	1	--	--	--	--	--	--
<u>STOMACH-FUNDIC</u>								
Dark area, glandular mucosa	--	--	--	1	--	--	--	--
<u>JEJUNUM</u>								
Pouch	--	--	--	1	--	--	--	--
<u>LIVER</u>								
Small extra lobe attached to right lobe	--	--	--	--	--	--	--	1
Right lobe adhered to right kidney	--	--	--	1	--	--	--	--
<u>UTERINE HORNS</u>								
Enlarged bilaterally	--	--	--	--	2	3	4	7
<u>MANDIBULAR LYMPH NODE</u>								
Left enlarged	--	2	2	2	--	--	--	--
Enlarged bilaterally	--	1	--	2	--	--	--	--
Red bilaterally	1	--	--	--	--	--	--	--
<u>MESENTERY</u>								
Red and congested	--	--	--	--	--	1	--	--

<sup>a</sup> Includes animal # 202, sacrificed in extremis on day 46.

Table 9

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Group Mean Absolute Organ Weights (grams) - Final Sacrifice

TRL Study #032-006

Dose Level (mg/kg/day)	Sex	Terminal body wt.(g) <sup>a</sup>	Organ Weight (grams)						
			Heart	Liver	Spleen	Kidney	Brain	Gonad	Thyroid <sup>b</sup>
0	M	499	1.555	18.583	0.740	3.611	2.008	4.931	0.021
30	M	514	1.551	19.768	0.790	3.829	2.043	5.104	0.024
125	M	515	1.629	18.529	0.765	3.813	2.052	4.827	0.024
500	M	484	1.548	17.577	0.760	3.647	2.002	4.789	0.024*
<hr/>									
0	F	292	1.077	10.941	0.519	2.222	1.898	0.080	0.020
30	F	298	1.077	11.606	0.539	2.353	1.945	0.087	0.018
125	F	293	1.026	10.503	0.504	2.217	1.890	0.087	0.018
500	F	287	1.073	10.277	0.505	2.244	1.913	0.088	0.019

\*p ≤ 0.05

<sup>a</sup> Terminal body weight taken on the day of necropsy.

<sup>b</sup> Including parathyroids

Table 9

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Group Mean Relative Weights (% of body weight) - Final Sacrifice

TRL Study #032-006

Dose Level (mg/kg/day)	Sex	Terminal body wt.(g) <sup>a</sup>	Terminal relative weights (% of body weight)						
			Heart	Liver	Spleen	Kidney	Brain	Gonad	Thyroid <sup>b,c</sup>
0	M	499	0.313	3.727	0.149	0.725	0.406	0.993	4.256
30	M	514	3.303	3.846	0.154	0.746	0.400	1.003	4.658
125	M	515	0.317	3.601	0.148	0.741	0.400	0.939	4.645
500	M	484	0.321	3.630	0.158	0.756	0.418	0.997	5.060**
0	F	292	0.370	3.754	0.178	0.765	0.658	0.027	6.871
30	F	298	0.362	3.879	0.181	0.792	0.657	0.029	6.188
125	F	293	0.353	3.582	0.173	0.761	0.650	0.030	6.219
500	F	287	0.376	3.578	0.177	0.788	0.674	0.031	6.792

\*\*p ≤ 0.01

<sup>a</sup> Terminal body weight taken on the day of necropsy.<sup>b</sup> Including parathyroids<sup>c</sup> X 10<sup>3</sup>

Table 10

Rat Oral Subchronic Toxicity Study of Normal Butanol<sup>a</sup>  
Incidence of Histologic Lesions - Final Sacrifice

TRL Study 032-006

Group	Dose Level (mg/kg/day)	MALES				FEMALES			
		I	II	III	IV	I	II	III	IV
	0	30	125	500		0	30	125	500
HEART	# Examined	20	20	20	20	20	20	20	20
Myelitis, subacute, focal		0	0	1	0	0	0	0	0
Pericarditis, acute, diffuse		0	0	1	0	0	0	0	0
Necrosis, focal		0	0	0	1	0	0	0	0
AORTA	# Examined	20	--	1	20	20	--	--	20
No lesion found									
THYMUS	# Examined	20	--	1	20	20	--	--	20
Lymphocytolysis		0	--	1	1	0	--	--	0
Agonal hemorrhage		0	--	0	0	0	--	--	1
LUNG W/BRONCHI	# Examined	20	2	1	20	20	--	--	20
Agonal hemorrhage		1	1	0	0	1	--	--	1
Pleuritis, acute, focal		0	0	1	0	0	--	--	0
Pleuritis, chronic, focal		0	0	0	1	0	--	--	0
Edema		0	0	1	0	0	--	--	0
Collapse		0	0	1	0	0	--	--	0
TRACHEA	# Examined	20	--	1	20	20	--	--	20
No lesion found									
ESOPHAGUS	# Examined	20	--	1	20	20	--	--	20
Perforation		0	--	1	0	0	--	--	0
Inflammation, acute, focal		0	--	1	0	0	--	--	0
Myositis, subacute, focal		0	--	0	1	0	--	--	0
STOMACH - FORESTOMACH	# Examined	20	--	1	20	20	--	--	20
No lesion found									

Table 10

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Incidence of Histologic Lesions - Final Sacrifice

TRL Study 032-006

Group	Dose Level (mg/kg/day)	MALES				FEMALES			
		I	II	III	IV	I	II	III	IV
	0	30	125	500		0	30	125	500
STOMACH - CARDIAC	# Examined	20	--	1	20	20	--	--	20
No lesion found									
STOMACH - FUNDIC	# Examined	20	--	1	20	20	--	--	20
Necrosis, focal		0	--	0	1	0	--	--	0
STOMACH - PYLORIC	# Examined	20	--	1	20	20	--	--	20
No lesion found									
SALIVARY GLAND- <u>SUBLINGUAL</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
SALIVARY GLAND- <u>MANDIBULAR</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
DUODENUM	# Examined	20	--	1	20	20	--	--	20
<u>Autolysis</u>		0	--	1	0	0	--	--	0
JEJUNUM	# Examined	20	--	1	20	20	--	--	20
No lesion found									
ILEUM	# Examined	20	--	1	20	20	--	--	20
No lesion found									
COLON	# Examined	20	--	1	20	20	--	--	20
No lesion found									

Table 10

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Incidence of Histologic Lesions - Final Sacrifice

TRL Study 032-006

Group	Dose Level (mg/kg/day)	MALES				FEMALES			
		I	II	III	IV	I	II	III	IV
	0	30	125	500		0	30	125	500
LIVER	# Examined	20	20	20	20	20	20	20	20
Hepatitis, subacute, focal, minimal		2	1	1	2	1	1	0	0
Hepatitis, subacute, focal, slight		0	0	0	0	2	1	0	1
Hepatitis, chronic, focal, slight		0	0	0	0	0	1	0	0
Cytoplasmic vacuolization, centrilobular, slight		1	0	0	0	0	0	0	0
PANCREAS	# Examined	20	--	1	20	20	--	--	20
No lesion found									
SPLEEN	# Examined	20	--	1	20	20	--	--	20
No lesion found									
MESENTERIC LYMPH NODE	# Examined	20	--	1	20	20	--	--	20
Lymphadenitis, chronic, diffuse		0	--	1	0	0	--	--	0
KIDNEYS	# Examined	20	20	20	20	20	20	20	20
Nephritis, subacute, focal, minimal		0	0	0	0	0	1	0	0
Nephritis, chronic, focal, unilateral, slight		1	0	0	0	0	0	0	0
Nephritis, chronic, focal, minimal		0	1	1	0	0	1	0	0
Nephritis, chronic, focal, slight		1	0	1	1	0	1	0	0
Mineralization - renal pelvis, focal		0	0	0	0	1	0	0	0
URINARY BLADDER	# Examined	20	--	1	20	20	--	--	20
Cystitis, chronic, diffuse, slight		0	--	0	1	0	--	--	0

Table 10

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Incidence of Histologic Lesions - Final Sacrifice

TRL Study 032-006

Group	Dose Level (mg/kg/day)	MALES				FEMALES			
		I	II	III	IV	I	II	III	IV
	0	30	125	500		0	30	125	500
<u>ADRENALS</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
<u>PITUITARY</u>	# Examined	20	--	1	19	20	--	--	20
Hypophyseal cleft - contains excess colloid		0	--	--	1	0	--	--	2
<u>EYES</u>	# Examined	20	--	1	20	20	--	--	20
Synechia, posterior		17	--	0	17	13	--	--	16
Autolysis		0	--	1	0	0	--	--	0
<u>OPTIC NERVES</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
<u>THYROIDS</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
<u>PARATHYROIDS</u>	# Examined	20	--	1	20	19	--	--	20
No lesion found									
<u>SPINAL CORD-</u>	# Examined								
<u>THORACIC</u>		20	--	--	20	20	--	--	20
No lesion found									
<u>SPINAL CORD-</u>	# Examined								
<u>LUMBAR</u>		20	--	--	20	20	--	--	20
No lesion found									

Table 10

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Incidence of Histologic Lesions - Final Sacrifice

TRL Study 032-006

Group	Dose Level (mg/kg/day)	MALES				FEMALES			
		I	II	III	IV	I	II	III	IV
	0	30	125	500		0	30	125	500
<u>BRAIN - FORE</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
<u>BRAIN - MID</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
<u>BRAIN - HIND</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
<u>FEMUR</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									
<u>TESTES</u>	# Examined	20	--	1	20	--	--	--	--
No lesion found									
<u>EPIDIDYMIDES</u>	# Examined	20	--	1	20	--	--	--	--
Proteinaceous material in tubules		1	--	0	0	--	--	--	--
<u>OVARIES</u>	# Examined	--	--	--	--	20	--	--	20
No lesion found									
<u>UTERINE HORNS</u>	# Examined	--	--	--	--	20	3	4	20
Hydrometra, bilateral		--	--	--	--	4	3	4	7
<u>CERVIX</u>	# Examined	--	--	--	--	20	--	--	20
No lesion found									
<u>SKIN</u>	# Examined	20	--	1	20	20	--	--	20
No lesion found									

Table 10

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Incidence of Histologic Lesions - Final Sacrifice

TRL Study 032-006

Group  
Dose Level (mg/kg/day)

MAMMARY GLAND      # Examined  
No lesion found

MUSCLE      # Examined  
Myositis, subacute, focal  
Degeneration, focal

NERVE      # Examined  
Section inadequate for diagnosis

MANDIBULAR LYMPH NODE # Examined  
Lymphadenitis, subacute, diffuse

MESENTERY      # Examined  
Thrombus

	MALES				FEMALES			
	I	II	III	IV	I	II	III	IV
0	30	125	500		0	30	125	500
19	--	1	19		20	--	--	20
20	--	1	20		20	--	--	20
0	--	0	0		1	--	--	0
0	--	0	1		0	--	--	0
20	--	1	20		20	--	--	20
1	--	0	0		0	--	--	0
1	3	2	4		--	--	--	--
1	3	2	4		--	--	--	--
--	--	--	--		--	1	--	--
--	--	--	--		--	1	--	--

**TOXICITY RESEARCH LABORATORIES, LTD.**

**TRL Study #032-006**

**Rat Oral Subchronic Toxicity Study**

**Compound:**

**Normal Butanol**

**APPENDIX A**

**Compound Assay Results**

The Muskegon County Wastewater Treatment Facility

The Muskegon County Wastewater Treatment Facility is a fully instrumented and staffed, non-profit, governmental facility. All analyses are performed according to the accepted U.S. Environmental Protection Agency methodologies and conform to rigid EPA certified quality control. The laboratory performs a full range of organic and inorganic analyses using modern instrumentation.

**I. Methodology for Methanol/Butanol/Isobutyl Alcohol**

**A. Materials and Reagents**

- 1) Distilled Water - Burdick and Jackson
- 2) Methanol/Butanol/Isobutyl Alcohol - same lot # as sample group

**B. Apparatus**

- 1) A GC system consisting of a Varian 2100 GC using a Varian flame ionization detector connected to a Spectra Physics Model 4100 recording integrator set at a chart speed of 0.5 cm/minute
- 2) A glass 1/8" X 8' column consisting of 1% SP 1000 on 60/80 Carbopack
- 3) Class A pipettes
- 4) Class A volumetric glassware

**C. Standards Preparation**

A series of standards is prepared, ranging from 0-16 mg/ml as follows:

<u>Alcohol / Distilled Water</u>	<u>Approximate Concentration (mg/ml)</u>
1 ml/500 ml	1.6
1 ml/200 ml	4.0
1 ml/100 ml	8.0
3 ml/200 ml	12.0
1 ml/50 ml	16.0

Linear response is established by injection of at least three of these standards and an initial standard curve prepared.

**D. Chromatography**

Prior to each analysis, at least one standard (usually 3) is prepared and injected into the GC to determine the response factor and calibrate the instrument. The samples are injected at a volume of 2 ul. The results are printed out on the integrator. Samples with concentrations above this level are diluted to a concentration within the linear range.

### E. Results

The concentration of each sample is calculated by the integrator as:

$$\text{CONCENTRATION} = \frac{\text{PEAK AREA OR PEAK HEIGHT}}{\text{RESPONSE FACTOR}}$$

### F. Instrument Settings

	<u>Methanol</u>	<u>Butanol</u>	<u>Isobutyl Alcohol</u>
injector temp.	75°C	150°C	160°C
column temp.	60°C Isothermal	140°C Isothermal	140°C Isothermal
carrier flow	25 ml/min N <sub>2</sub>	25 ml/min N <sub>2</sub>	25 ml/min N <sub>2</sub>
attenuation	2X10 <sup>-11</sup> X64 <sup>2</sup>	2X10 <sup>-11</sup> X64 <sup>2</sup>	2X10 <sup>-11</sup> X64 <sup>2</sup>
injection volume	2 ul	2 ul	2 ul

## II. Standard Operating Procedure for Varian Model 2100 Gas Chromatograph with Varian flame ionization detector connected to a Spectra Physics Model 4100 recording integrator

### A. Analysis

- 1) Choose and check the oven temperature program.
- 2) Install appropriate column
- 3) Check column for gas leaks.
- 4) Check the detector function.
- 5) Run standards of concentrations comparable to the samples if known (typically 2-3 standards). It is assumed that a 5 point standard curve has been established.
- 6) Run the sample(s).
- 7) Calculate sample concentrations, using the nearest standard.

### B. Maintenance/Calibration

- 1) After each run, the column is baked at high temperature.
- 2) Run a blank for each batch of 10 samples.
- 3) If signs of column deterioration are noticed, such as change in peak shape:
  - a) bake the column for extended period
  - b) either repack the column partially or completely
- 4) Compare the standard run with the initial standard curve.

- 5) In case the instrument is not functioning as per manufacturer's specifications, run diagnostic procedure for that instrument, record any corrective measures taken or service calls placed.

### III. Sample Handling Procedure

- 1) Incoming samples are logged in by laboratory personnel, assigned control number (WWCN), and presented to the chemist.
- 2) Samples are stored according to specified stability. If stability is not specified samples are stored under refrigeration at approximately 4-8°C.
- 3) Prior to analysis, samples are equilibrated to room temperature.
- 4) Analyses of samples are conducted according to specific methodologies and specific instrument standard operating procedures.
- 5) After analyzing the samples, they are returned to the submitter.

**ERCO**

205 Alewife Brook Parkway, Cambridge, Massachusetts 02138 (617) 661-3111 Telex 650-256-7697 (MCI)

A DIVISION OF

**ENSECO**  
INCORPORATED**1. Application.**

This method covers the determination of compounds by direct aqueous injection. The following compounds can be detected using column A and temperature program A: acetone, methyl isobutyl ketone (MIBK), isobutyl alcohol, methyl alcohol, ethyl acetate, n-butyl alcohol and crotonaldehyde. The following compounds can be detected using system B and temperature program B: p-, m-, and o-cresol.

**2. Summary.**

A portion of a sample is injected directly onto a gas chromatograph capillary column. The gas chromatograph is temperature programmed to separate the constituents which are then detected by a flame ionization detector.

**3. Instrumentation and Apparatus.**

3.1. Gas chromatograph -- Hewlett-Packard 5880 with auto-sampler and integrator. Oven temperature profile A programmed as hold 8 min at 50°C, then to 220°C at 8°C/min and hold 5 min. Program B: hold 5 min at 50°C then to 250°C at 10°C/min and hold 15 min.

3.2. Column A -- 60 m x 0.32 mm ID, 0.25 µm film SUPEL-COWAX 10 fused silica capillary column. Set linear velocity to 25 cm/sec, He, at 100°C (flow rate = 1.2 ml/min).

Column B -- 30 m x 0.318 mm ID, 0.25 µm film SE - 54 fused silica capillary column. Set linear velocity

to 25 cm/sec, He, at 100°C (flow rate = 1.2 ml/min).

3.3. Injector -- configure for sample splitting and adjust ratio to 100:1. Set heater temperature to 200°C.

3.4. Detector -- Hewlett-Packard flame ionization detector. Hydrogen flow set at 40 ml/min. Air flow set at 400 ml/min. Set sensitivity at 2+2 and adjust if necessary. Set heater temperature to 250°C.

3.5. Syringes -- 1 ml, 100 µl, and 10 µl gas-tight glass for diluting and for sample transfer.

#### 4. Reagents.

4.1. Reagent Water -- prepare with Corning Mega-Pure distillation system and filter through activated charcoal prior to use.

4.2. Methylene Chloride -- J. T. Baker "Resi-analyzed" or equivalent.

4.3. Standard Solution -- prepare by adding pure material to water. Pure material should be assayed reference liquid such as Chem Serve reagents. If not immediately available, supplied compound may be used.

4.3.1. Place about 9 ml of solvent into a stoppered 10 ml flask. Weigh the flask. Add one or two drops of pure material to the flask and reweigh. Dilute to

volume, mix well, and store in a teflon-sealed screw-cap vial at 4°C.

## 5. Calibration.

5.1. External Standard Calibration -- Prepare working standards to bracket the concentration range, of the samples of interest. Working standards are prepared by diluting the standard solution with water or methylene chloride if the samples are corn oil based. Analyze according to procedure section then calculate response factors using this equation:

$$RF = \frac{\text{concentration of standard}}{\text{area of standard}}$$

If the response factors are constant over the working range (10% Relative Percent Difference), an average response factor may be used for calculations.

## 6. Quality Control.

6.1. Interference -- a water blank must be run with each test to check for system contamination. A blank should also be run between samples of high concentration.

6.2 Purity -- reagents used in the procedure should also be analyzed with each test to determine their purity.

- 6.3 Spikes -- sample matrixes should be spiked with the compounds of interest and a percent recovery calculated to access matrix effects and method accuracy.
- 6.4. Duplicates -- Some samples should be analyzed in duplicate and a relative percent difference calculated to access method precision.

## 7. Procedure.

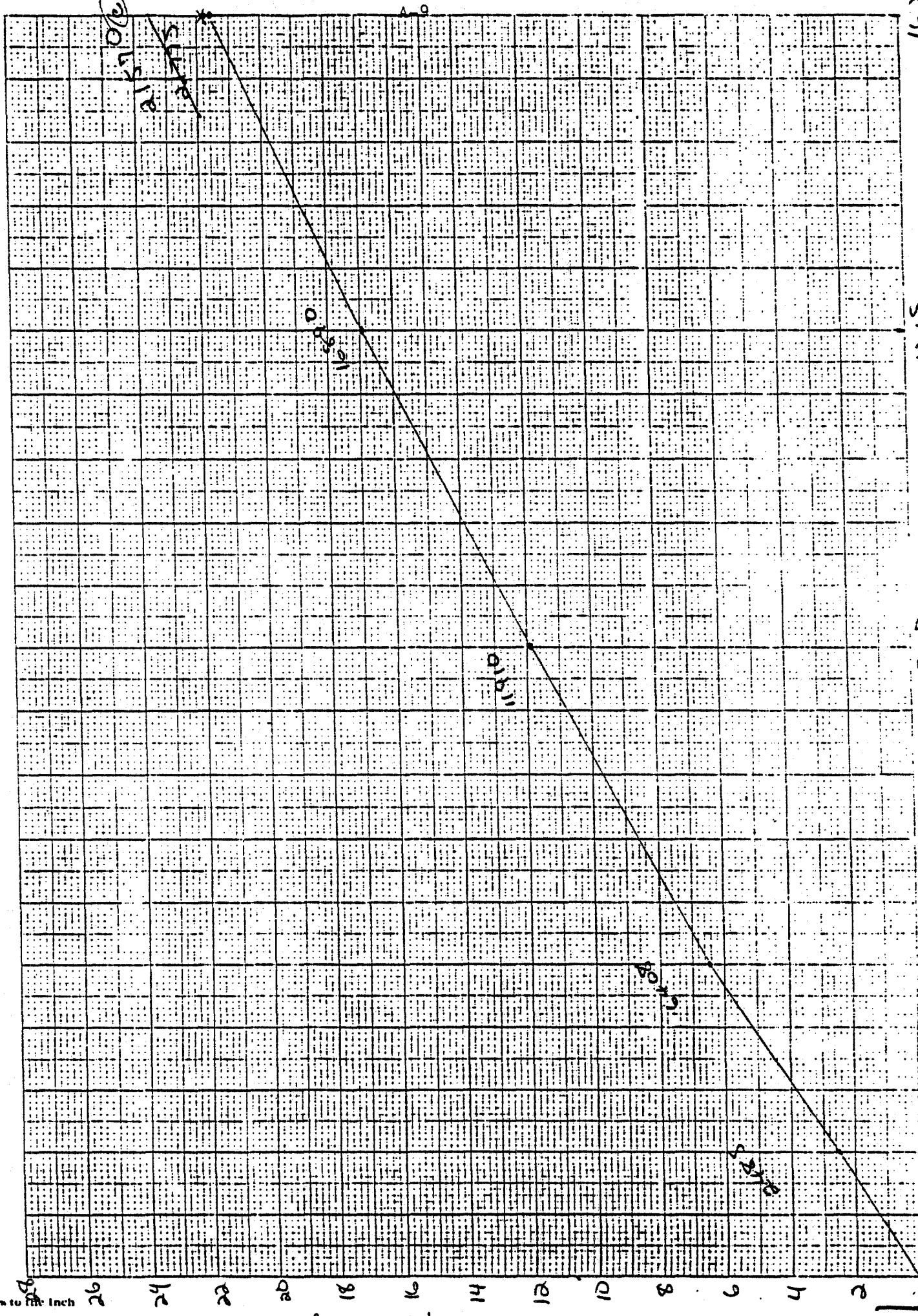
- 7.1. Calibration as in section 5.
- 7.2. Sample Preparation -- allow samples to come to room temperature before handling. Dilute if necessary to bring concentrations within system working range by adding portion of sample to water or to methylene chloride if corn oil based.
- 7.3. Analysis -- introduce sample by direct injection of 1 - 2  $\mu$ l into the GC injection port and begin the temperature program.
- 7.4. Identification -- as the compounds are analyzed individually, there should be no coelution interferences. Retention time should still be checked against the standard.

## 8. Calculation.

- 8.1. Concentration -- calculate using peak area and RF determined in section 5.1.

- 8.2. Dilution -- take into account any dilution performed on the sample or the standard.
- 8.3 Report results in mg/ml without correction for recovery percentage.

Butanol 10/85





# County of Muskegon

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 PHONE 616-853-2291

September 4, 1985

Y.A. Demirjian, Ph.D.  
 Manager-Director

## LABORATORY ANALYSES

COMPANY: Toxicity Research Laboratories, Study #032-006,  
 Lot #3597 KVVE

Date: August 27, 1985

Week #1

<u>WWCN</u>	<u>Sample Designation</u>	<u>Normal Butanol (mg/ml)</u>
0885135	8/26/85, Deionized Water, Group I, 0 mg/ml	0.0
0885136	Normal Butanol Standard	Standard
0885137	8/26/85, Normal Butanol, Group II, 3.0 mg/ml	2.99
0885138	8/26/85, Normal Butanol, Group III, 12.5 mg/ml	12.16
0885139	8/26/85, Normal Butanol, Group IV, 50 mg/ml	51.57

Samples taken week 1 day 1; analyzed for concentration

CLIENT: Toxicity Research      ERCO/A DIVISION OF ENSECO, INC.  
Laboratories, Inc.

SAMPLE RECEIVED: 8/29/85

ANALYSIS COMPLETED: 9/11/85

RESULTS IN: mg/ml

SOLVENT ANALYSIS  
- Data Report -

Client ID	ERCO ID	N-Butyl Alcohol	Theoretical Concentration
Group I, Week 1	20299	ND	0.0
Group II, Week 1	20295	3.8	3.0
Group III, Week 1	20296	12.0	12.5
Group IV, Week 1	20297	51.6	50.0
- - - - -			
N-Butyl Alcohol, Lot #3597-KVVE	20298	6.5 <sup>a</sup> (21 unknowns)	Lot is approximately 99.4% pure.

ND = Not detected above the minimum reporting limit of 1.0 mg/ml.

Reported by: wtr  
Checked by: AD

<sup>a</sup>Approximate total concentration of unknowns using response factor of n-butyl alcohol.



# County of Muskegon

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September 25, 1985

Y.A. Demirjian, Ph.D.  
 Manager-Director

## LABORATORY ANALYSES

COMPANY: Toxicity Research Laboratories, Study #032-006,  
 Lot #3597 KVVE, Week 4

Date: September 16, 1985

<u>WWCN</u>	<u>Sample Designation</u>	<u>n-Butanol mg/ml</u>
0985125	Pure Butanol	-----
0985126	Group I, Deionized Water	0.0
0985127	Group II, 3.0 mg/ml	3.07
0985128	Group III, 12.5 mg/ml	12.27
0985129	Group IV, 50 mg/ml	49.78

CLIENT: Toxicity Research ERCO / A DIVISION OF ENSECO INC.Laboratories, Ltd.SAMPLE RECEIVED: 9/19/85ANALYSIS COMPLETED: 10/1/85RESULTS IN: mg/mlSOLVENT ANALYSIS

- Data Report -

Client ID	ERCO ID	n-butyl alcohol	Theoretical Concentration
Group I	20986	ND	0.0
Week 4			
Group II	20987	3.0	3.0
Week 4			
Group III	20988	14.3	12.5
Week 4			
Group IV	20989	46.1	50.0
Week 5			
n-butyl alcohol	20990	2.0 <sup>a</sup> (5 unknowns)	
Lot #3597 KVVE		Lot is approximately 99.8% pure.	

ND = Not detected above the minimum reporting limit of 1 mg/ml.

Reported by: mc  
Checked by: AS<sup>a</sup>Total approximate concentration of unknowns using the n-butyl alcohol response factor.



# County of Muskegon

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Y.A. Demirjian, Ph.D.  
 Manager-Director

December 12, 1985

COMPANY: TRL, Study #032-006, Lot #3597 KVVE, Week #6

Date: September 30, 1985

<u>WWCN</u>	<u>Sample Designation</u>	<u>Butanol mg/ml</u>
0985185	Pure Butanol	
0985186	Group I, Deionized water, 0.0 mg/ml	0.00
0985187	Group II, 3.0 mg/ml	2.94
0985188	Group III, 12.5 mg/ml	12.73
0985189	Group IV, 50.0 mg/ml	50.92

RECEIVED  
DEC 20 1985

DEC 20 1985

RECEIVED  
DEC 20 1985

CLIENT: Toxicity Research Laboratories, Inc.

ERCO/A DIVISION OF ENSECO, INC.

SAMPLE RECEIVED: 10/5/85

ANALYSIS COMPLETED: 10/10/85

RESULTS IN: mg/ml

SOLVENT ANALYSIS

- Data Report -

Client ID	ERCO ID	N-Butyl Alcohol	Theoretical Concentration
Group I, Week 6	21468	ND	0.0
Group II, Week 6	21469	2.8	3.0
Group III, Week 6	21470	12.1	12.5
Group IV, Week 6	21471	49.6	50.0
<hr/>			
N-Butyl Alcohol, Lot #3597	21472	4.8 <sup>a</sup> (16 unknowns)	

Lot is approximately  
99.5% pure.

ND = Not detected above the minimum reporting limit of 1.0 mg/ml.

Reported by: AS  
Checked by: AS

<sup>a</sup>Approximate total concentration of unknowns using response factor of n-butyl alcohol.



# County of Muskegon

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 Manager-Director

## LABORATORY ANALYSES

COMPANY: TRL

Date October 31, 1985

<u>WWCN</u>	<u>Sample Designation</u>	<u>Butanol mg/ml</u>
1085-149	032-006 Week #10, 10/28/85 Lot 3597 KVVE Pure Butanol	
1085-150	032-006 Week #10, 10/28/85 Lot 3597 KVVE Group I, 0.0 mg/ml	0.0
1085-151	032-006 Week #10, 10/28/85 Lot 3597 KVVE Group II, 3.0 ml/ml	2.85
1085-152	032-006 Week #10, 10/28/85 Lot 3597 KVVE Group III, 12.5 mg/ml	12.20
1085-153	032-006 Week #10, 10/28/85 Lot 3597 KVVE Group IV, 50 mg/ml	49.42

CLIENT: Toxicity Research  
Laboratories, Ltd.

ENSECO INCORPORATED

SAMPLE RECEIVED: 11/6/85SOLVENT ANALYSISANALYSIS COMPLETED: 11/14/85RESULTS IN: mg/ml

- Data Report -

Client ID	ENSECO ID	Normal butanol	Theoretical Concentrations
Group I, Week 10	23108	ND	0.0
Group II, Week 10	23109	2.8	3.0
Group III, Week 10	23110	14.0	12.5
Group IV, Week 10	23111	59.1	50.0
- - - - -			
Normal butanol, Lot #3597 KVVE	23112	9.4 <sup>a</sup> (13 unknowns) Lot is approximately 99.1% pure.	

ND = Not detected above the minimum reporting limit of 1.0 mg/ml.

Reported by: W.M.  
Checked by: JKS

<sup>a</sup>Approximate total concentration of unknowns using response factor of normal butanol.



# County of Muskegon

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WASTEWATER MANAGEMENT SYSTEM  
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 PHONE 616-853-2291

December 23, 1985

Y.A. Demirjian, Ph.D.  
 Manager-Director

## LABORATORY ANALYSES

COMPANY: Toxicity Research Laboratories, Study #032-006,  
 Lot #3597 KVVE, Week #13

Date: November 18, 1985

<u>WWCN</u>	<u>Sample Designation</u>	<u>Butanol (mg/ml)</u>
1185210	Group I, 0.0 mg/ml	0.0
1185211	Group II, 3.0 mg/ml	2.99
1185212	Group III, 12.5 mg/ml	12.37
1185213	Group IV, 50.0 mg/ml	49.40

CLIENT: Toxicity Research Laboratories, Ltd.  
 SAMPLE RECEIVED: 11/21/85  
 ANALYSIS COMPLETED: 12/2/85  
 RESULTS IN: mg/ml

ENSECO INCORPORATED

SOLVENT ANALYSIS

- Data Report -

Client ID	ENSECO ID	Normal butanol	Theoretical Concentrations
Group I, Week 13	23702	ND	0.0
Group II, Week 13	23703	2.4	3.0
Group III, Week 13	23704	11.8	12.5
Group IV, Week 13	23705	47.9	50.0
- - - - -			
Normal butanol, Lot #3597 KVVE	23706	0.7 <sup>a</sup> (3 unknowns) Lot is approximately 99.9% pure.	

ND = Not detected above the minimum reporting limit of 1.0 mg/ml.

Reported by:     
Checked by: YS

<sup>a</sup>Approximate total concentration of unknowns using response factor of normal butanol.



# County of Muskegon

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WASTEWATER MANAGEMENT SYSTEM  
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December 23, 1985      Y.A. Demirjian, Ph.D.  
 Manager-Director

## LABORATORY ANALYSES

COMPANY: Toxicity Research Laboratories, Study #032-006,  
 Lot #3597 KVVE, Week #13, Day 8

Date: November 25, 1985

<u>WWCN</u>	<u>Sample Designation</u>	<u>Butanol (mg/ml)</u>
1195236	Group I, 0.0 mg/ml	0.0 0.0 0.0
1185237	Group II, 3.0 mg/ml	3.19 3.18 3.10
1185238	Group III, 12.5 mg/ml	12.93 13.02 12.34
1185239	Group IV, 50.0 mg/ml	51.88 51.02 51.53

**TOXICITY RESEARCH LABORATORIES, LTD.**

**TRL Study #032-006**

**Rat Oral Subchronic Toxicity Study**

**Compound:**

**Normal Butanol**

**APPENDIX B**

**Individual Body Weights**

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	INITIAL Grams	PRE-	WEEK	WEEK	WEEK
		TEST Grams	1 Grams	2 Grams	3 Grams
<b>Group I      0 mg/kg/day</b>					
1	83	132	184	234	287
2	95	148	208	266	324
3	105	161	220	275	332
4	92	144	192	238	284
5	89	129	162	209	252
6	96	155	205	261	312
7	84	132	175	225	272
8	95	152	207	263	319
9	91	149	211	260	307
10	89	139	180	226	284
11	89	139	184	227	257
12	98	156	192	251	291
13	105	167	221	279	317
14	75	124	168	209	251
15	82	131	180	233	282
16	84	142	191	251	300
17	94	146	198	255	306
18	84	138	189	242	293
19	106	161	217	273	338
20	89	142	200	253	305
21	92	148	196	248	294
22	96	153	205	263	316
23	88	139	191	246	292
24	90	142	193	249	299
25	82	126	174	219	259
26	84	139	178	247	307
27	85	136	184	231	277
28	90	146	193	239	286
29	86	143	190	242	293
30	93	156	188	243	298
Mean	90.4	143.8	192.5	245.2	294.5
S.D.	7.23	10.74	14.78	18.19	22.26

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	INITIAL Grams	PRE- TEST	WEEK 1	WEEK 2	WEEK 3
		Grams	Grams	Grams	Grams
Group II		30 mg/kg/day			
61	105	165	225	280	332
62	82	139	188	245	289
63	92	150	206	262	314
64	90	146	194	247	290
65	82	136	195	236	288
66	88	140	200	253	306
67	97	160	215	270	328
68	93	140	192	242	297
69	81	138	196	245	289
70	96	151	204	259	308
71	94	149	198	248	295
72	88	143	193	246	295
73	96	154	196	248	294
74	97	148	176	241	301
75	88	142	198	243	289
76	85	137	186	234	286
77	95	153	212	270	317
78	91	146	204	266	322
79	81	136	187	234	286
80	88	139	192	240	279
81	89	144	194	253	312
82	93	151	191	244	297
83	97	155	213	266	310
84	104	163	219	281	335
85	91	149	207	259	313
86	95	158	214	265	315
87	83	133	195	259	323
88	94	144	194	255	299
89	88	145	200	261	314
90	91	146	193	253	306
Mean	91.1	146.7	199.2	253.5	304.3
S.D.	6.14	8.26	10.84	12.75	14.96

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	INITIAL Grams	PRE- TEST	WEEK 1	WEEK 2	WEEK 3
		Grams	Grams	Grams	Grams
<b>Group III      125 mg/kg/day</b>					
121	92	149	206	257	308
122	80	133	187	243	293
123	92	151	193	255	306
124	89	147	209	264	330
125	84	138	197	246	307
126	82	128	168	216	263
127	92	151	206	263	318
128	99	158	220	272	330
129	90	140	191	245	296
130	91	149	199	252	298
131	95	147	199	250	294
132	94	156	202	259	312
133	100	149	X		
134	92	147	201	266	324
135	84	132	173	228	284
136	85	131	173	221	266
137	89	145	193	245	287
138	94	160	222	283	339
139	83	133	187	234	283
140	96	159	220	276	333
141	87	148	196	247	298
142	87	146	203	254	306
143	86	137	189	244	288
144	96	152	214	274	326
145	98	152	204	260	306
146	103	164	205	270	324
147	98	161	216	267	318
148	90	144	196	249	306
149	84	132	184	247	300
150	88	141	195	245	296
Mean	90.7	146.0	198.2	252.8	304.8
S.D.	5.86	9.83	13.75	15.94	19.02

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	INITIAL Grams	PRE- TEST	WEEK 1	WEEK 2	WEEK 3
		Grams	Grams	Grams	Grams
Group IV      500 mg/kg/day					
181	88	140	185	238	280
182	88	139	190	246	308
183	89	133	176	224	272
184	84	134	181	238	284
185	98	158	215	268	316
186	94	152	208	260	319
187	84	135	184	230	280
188	85	122	162	210	258
189	88	149	204	256	301
190	88	142	191	246	299
191	84	128	172	218	264
192	94	144	181	217	260
193	85	131	183	237	286
194	92	145	191	236	276
195	97	153	198	237	300
196	94	149	196	237	280
197	83	133	181	222	266
198	81	124	169	211	256
199	97	143	179	239	292
200	97	163	216	279	336
201	98	159	218	283	344
202	92	155	207	255	314
203	80	137	183	232	270
204	96	147	196	241	289
205	95	146	195	239	286
206	93	153	194	229	293
207	95	154	202	266	318
208	90	133	172	208	249
209	99	148	203	251	303
210	102	157	205	260	305
Mean	91.0	143.5	191.2	240.4	290.1
S.D.	5.95	10.86	14.57	19.47	23.67

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	INITIAL	PRE-	WEEK	WEEK	WEEK
		TEST	1	2	3
		Grams	Grams	Grams	Grams
Group I		0 mg/kg/day			
31	90	136	157	174	190
32	85	120	135	150	173
33	89	132	151	177	197
34	76	116	143	163	171
35	81	121	132	151	169
36	80	123	147	163	193
37	86	126	154	171	190
38	89	132	164	192	212
39	82	120	145	170	185
40	95	142	166	195	214
41	85	131	155	181	205
42	89	125	148	157	184
43	88	125	144	150	162
44	78	123	158	165	204
45	84	129	151	164	184
46	83	121	146	172	187
47	86	129	165	202	228
48	86	126	147	171	190
49	87	128	148	165	197
50	87	132	162	175	215
51	76	121	154	181	203
52	78	119	152	179	198
53	89	136	166	188	210
54	98	139	163	183	194
55	85	124	155	169	196
56	83	111	121	143	158
57	99	149	181	191	213
58	89	136	161	183	203
59	99	141	177	193	224
60	83	134	160	176	210
Mean		86.2	128.2	153.6	173.1
S.D.		6.07	8.50	12.47	14.59
					17.38

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

FEMALES

ANIMAL NUMBER	INITIAL Grams	PRE- TEST	WEEK 1	WEEK 2	WEEK 3
		Grams	Grams	Grams	Grams
Group II      30 mg/kg/day					
91	85	128	156	185	213
92	85	139	174	197	211
93	89	130	144	172	200
94	87	130	153	178	199
95	92	133	141	160	174
96	84	130	163	193	218
97	89	130	156	185	211
98	85	129	167	192	211
99	84	124	152	174	189
100	88	137	168	175	211
101	83	125	154	178	202
102	71	113	151	170	201
103	95	138	163	185	205
104	90	137	168	189	213
105	83	131	154	180	198
106	87	130	167	187	217
107	94	133	163	186	213
108	74	112	141	164	188
109	91	136	165	187	207
110	83	127	153	173	193
111	80	110	133	154	171
112	90	124	144	165	185
113	90	139	170	192	220
114	87	128	161	178	200
115	78	118	143	171	202
116	89	129	168	208	240
117	97	138	160	192	210
118	88	136	161	174	191
119	81	121	150	170	197
120	87	137	167	190	201
Mean	86.2	129.1	157.0	180.1	203.0
S.D.	5.71	8.00	10.37	11.92	13.97

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	INITIAL Grams	PRE- TEST	WEEK 1	WEEK 2	WEEK 3
		Grams	Grams	Grams	Grams
<b>Group III      125 mg/kg/day</b>					
151	95	140	156	178	198
152	85	121	143	164	183
153	88	137	167	192	219
154	88	129	155	178	193
155	86	130	154	174	188
156	73	115	133	160	169
157	88	136	171	192	217
158	87	125	138	144	160
159	80	126	152	175	191
160	79	122	158	177	209
161	95	134	166	184	220
162	79	119	145	166	171
163	93	139	171	193	210
164	79	128	165	187	216
165	83	130	164	177	195
166	91	126	140	154	181
167	94	139	161	186	212
168	86	126	138	160	174
169	81	127	159	188	201
170	82	122	161	170	208
171	88	129	154	177	199
172	94	132	157	173	180
173	73	115	137	158	179
174	77	118	143	151	173
175	91	132	153	180	204
176	87	122	144	166	184
177	89	133	161	179	193
178	82	123	149	171	205
179	81	121	152	169	182
180	91	133	154	174	199
Mean	85.5	127.6	153.4	173.2	193.8
S.D.	6.24	7.01	10.50	12.43	16.40

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

FEMALES

ANIMAL NUMBER	INITIAL	PRE-	WEEK	WEEK	WEEK
		TEST	1	2	3
		Grams	Grams	Grams	Grams
Group IV      500 mg/kg/day					
211	74	113	135	149	169
212	85	128	148	169	192
213	88	129	158	183	206
214	83	121	142	159	173
215	93	139	158	184	208
216	86	132	155	179	200
217	95	140	167	187	206
218	89	126	145	167	177
219	80	124	154	181	198
220	94	133	157	187	208
221	90	136	150	177	193
222	82	131	160	180	206
223	84	120	153	173	196
224	81	125	152	176	198
225	85	132	165	188	214
226	95	136	157	181	208
227	83	123	153	180	201
228	76	121	145	168	191
229	74	118	135	163	187
230	79	134	167	189	208
231	87	118	138	158	182
232	87	121	130	148	162
233	81	118	142	159	184
234	87	125	149	169	193
235	80	121	140	166	185
236	82	112	137	166	177
237	89	129	153	185	211
238	86	127	150	179	196
239	73	131	149	175	182
240	91	131	143	171	202
Mean	84.6	126.5	149.6	173.2	193.8
S.D.	6.07	7.31	9.63	11.26	13.51

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	4	5	6	7	8
	Grams	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day				
1	330	356	372	X	
2	367	387	410	X	
3	382	424	451	X	
4	323	352	377	X	
5	283	313	323	X	
6	352	381	409	X	
7	310	345	362	X	
8	362	384	415	X	
9	359	388	416	X	
10	327	361	398	X	
11	297	332	353	370	384
12	316	333	350	365	376
13	360	390	419	441	462
14	285	316	336	343	358
15	324	355	374	395	419
16	337	362	392	420	443
17	356	395	419	443	468
18	333	371	387	411	438
19	391	426	464	492	519
20	345	374	399	419	443
21	341	366	378	403	413
22	367	403	428	454	477
23	326	359	381	400	423
24	340	365	386	401	419
25	308	342	370	393	411
26	358	395	425	442	471
27	315	343	374	397	412
28	321	345	373	390	408
29	337	376	406	434	448
30	349	377	403	430	455
Mean	336.7	367.2	391.7	412.1	432.4
S.D.	26.43	27.78	31.73	34.20	38.03

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	4	5	6	7	8
	Grams	Grams	Grams	Grams	Grams
Group II	30 mg/kg/day				
61	373	410	440	X	
62	332	363	377	X	
63	357	393	421	X	
64	324	347	372	X	
65	317	354	378	X	
66	351	386	421	X	
67	365	397	419	X	
68	338	371	404	X	
69	327	362	391	X	
70	348	382	407	X	
71	327	356	370	389	397
72	326	361	381	398	414
73	323	352	375	392	402
74	350	400	431	455	483
75	326	357	379	400	409
76	321	348	368	385	398
77	355	392	418	439	463
78	372	413	435	463	470
79	326	352	380	403	418
80	303	337	366	391	400
81	368	404	437	460	487
82	340	372	416	452	486
83	353	388	416	444	469
84	371	410	433	460	485
85	357	396	413	430	450
86	347	379	407	428	449
87	380	426	461	494	520
88	339	365	385	404	424
89	361	396	425	449	469
90	344	377	405	432	452
Mean	344.0	378.2	404.4	428.4	447.3
S.D.	19.61	23.32	25.87	31.36	37.00

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	4	5	6	7	8
	Grams	Grams	Grams	Grams	Grams
Group III 125 mg/kg/day					
121	350	387	414	X	
122	328	375	403	X	
123	360	396	418	X	
124	368	409	429	X	
125	348	382	407	X	
126	286	306	324	X	
127	359	393	422	X	
128	377	400	412	X	
129	334	366	392	X	
130	340	367	392	X	
131	334	372	399	422	447
132	359	392	420	447	461
133	X				
134	377	410	438	463	489
135	316	349	378	370	401
136	297	328	346	359	379
137	323	355	382	401	413
138	391	429	452	470	497
139	321	357	390	409	429
140	379	404	431	462	489
141	336	366	386	409	439
142	351	385	419	440	468
143	336	361	391	419	435
144	370	412	442	468	493
145	345	380	390	407	414
146	376	426	439	462	473
147	352	388	410	423	444
148	354	388	420	445	461
149	350	389	421	442	463
150	330	366	390	412	433
Mean	346.4	380.6	405.4	427.9	448.8
S.D.	24.53	27.13	27.71	31.89	32.97

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	4	5	6	7	8
	Grams	Grams	Grams	Grams	Grams
Group IV	500 mg/kg/day				
181	311	326	343	X	
182	344	379	403	X	
183	312	330	344	X	
184	325	358	379	X	
185	365	395	425	X	
186	365	405	440	X	
187	316	347	375	X	
188	289	310	318	X	
189	336	363	388	X	
190	343	373	404	X	
191	294	320	341	352	366
192	305	337	363	392	416
193	326	349	379	401	427
194	310	333	356	373	325
195	339	373	400	416	434
196	323	353	382	403	418
197	297	319	342	361	375
198	286	318	335	350	363
199	335	361	379	403	423
200	380	417	444	470	496
201	390	424	445	468	488
202	348	373	397	X	
203	308	335	312	341	363
204	332	353	375	391	406
205	320	348	371	391	407
206	335	376	404	430	448
207	352	379	400	416	441
208	284	317	335	357	370
209	339	376	395	420	444
210	338	371	392	415	440
Mean	328.2	357.3	378.9	397.4	413.2
S.D.	26.68	30.01	35.36	36.56	44.29

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	4	5	6	7	8
	Grams	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day				
31	212	220	230	X	
32	187	202	204	X	
33	211	233	239	X	
34	192	203	210	X	
35	178	199	201	X	
36	205	228	239	X	
37	211	224	227	X	
38	240	255	265	X	
39	202	217	232	X	
40	233	247	252	X	
41	220	236	253	265	276
42	202	215	215	240	253
43	173	190	195	204	219
44	208	217	235	243	243
45	192	204	219	226	232
46	210	219	227	233	242
47	265	285	307	319	342
48	202	219	226	231	243
49	217	232	238	252	254
50	230	230	250	264	273
51	228	233	255	259	269
52	224	237	258	267	287
53	235	248	256	270	277
54	208	215	231	240	258
55	200	213	227	235	236
56	170	176	186	195	197
57	235	252	261	274	284
58	227	235	244	247	256
59	242	257	265	277	297
60	230	252	270	276	276
Mean	213.0	226.4	237.2	250.9	260.7
S.D.	21.75	22.62	25.45	27.88	31.17

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8
	Grams	Grams	Grams	Grams	Grams
Group II      30 mg/kg/day					
91	232	242	252	X	
92	245	262	277	X	
93	211	239	245	X	
94	212	218	239	X	
95	195	209	213	X	
96	234	257	256	X	
97	222	235	248	X	
98	232	244	254	X	
99	214	213	231	X	
100	228	237	258	X	
101	221	240	250	260	270
102	204	228	241	242	259
103	226	243	249	261	277
104	224	238	260	271	280
105	216	223	232	242	250
106	233	250	260	272	287
107	223	233	239	250	262
108	200	215	228	239	239
109	229	241	254	256	264
110	203	225	224	237	256
111	187	200	211	216	230
112	203	211	225	231	239
113	237	256	276	290	305
114	213	220	242	247	257
115	218	225	247	253	259
116	265	293	310	319	329
117	234	252	261	273	290
118	200	209	221	220	242
119	209	238	246	268	288
120	227	244	245	248	264
Mean	219.9	234.7	246.5	254.8	267.4
S.D.	16.37	19.34	20.13	23.84	24.25

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	4	5	6	7	8
	Grams	Grams	Grams	Grams	Grams
<b>Group III      125 mg/kg/day</b>					
151	213	220	234	X	
152	190	206	213	X	
153	240	252	275	X	
154	204	217	216	X	
155	200	214	224	X	
156	188	205	220	X	
157	231	252	274	X	
158	167	178	181	X	
159	214	227	237	X	
160	238	253	256	X	
161	241	258	262	278	291
162	197	219	225	230	246
163	232	253	277	292	301
164	235	263	279	285	298
165	210	219	225	249	251
166	198	204	222	228	232
167	228	249	264	274	284
168	184	191	203	212	225
169	233	246	258	275	270
170	231	253	250	287	306
171	215	224	242	252	261
172	202	220	230	229	242
173	189	211	222	232	232
174	198	209	224	232	237
175	225	239	254	268	276
176	206	222	238	256	263
177	217	235	241	253	261
178	220	225	237	243	246
179	206	225	230	237	252
180	214	224	242	257	265
Mean	212.2	227.1	238.5	253.5	262.0
S.D.	18.87	21.06	23.17	23.13	24.36

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	4	5	6	7	8
	Grams	Grams	Grams	Grams	Grams
<b>Group IV      500 mg/kg/day</b>					
211	185	199	201	X	
212	210	225	237	X	
213	231	252	267	X	
214	190	205	212	X	
215	230	245	260	X	
216	213	223	245	X	
217	230	242	251	X	
218	193	203	207	X	
219	221	232	237	X	
220	222	234	250	X	
221	200	216	228	238	235
222	224	244	261	265	278
223	204	227	240	246	268
224	X				
225	231	241	254	254	261
226	227	244	259	268	285
227	224	243	253	265	276
228	203	226	231	230	239
229	207	229	237	242	253
230	241	256	266	276	282
231	206	214	220	226	241
232	171	174	188	194	199
233	199	213	224	245	264
234	207	216	233	238	250
235	203	212	220	236	247
236	195	214	219	226	225
237	225	239	255	273	277
238	214	228	238	243	256
239	212	222	238	242	253
240	217	224	247	258	258
Mean	211.6	225.6	237.2	245.5	255.1
S.D.	16.11	17.85	19.97	19.82	21.56

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13
	Grams	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day				
1	X				
2	X				
3	X				
4	X				
5	X				
6	X				
7	X				
8	X				
9	X				
10	X				
11	400	410	423	447	446
12	383	395	403	431	434
13	475	495	506	525	530
14	369	385	396	418	417
15	433	445	458	479	480
16	458	486	504	528	541
17	480	488	494	505	502
18	459	480	496	523	523
19	529	552	570	587	593
20	461	482	496	519	536
21	430	450	460	474	481
22	496	512	528	547	557
23	437	445	452	474	475
24	431	441	441	464	464
25	425	440	454	472	472
26	488	513	529	547	552
27	421	439	450	465	474
28	420	439	450	467	474
29	467	485	463	503	515
30	472	495	502	519	520
Mean	446.7	463.9	473.8	494.7	499.3
S.D.	39.26	42.08	43.92	42.67	45.08

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13
	Grams	Grams	Grams	Grams	Grams
Group II      30 mg/kg/day					
61	X				
62	X				
63	X				
64	X				
65	X				
66	X				
67	X				
68	X				
69	X				
70	X				
71	411	425	438	460	473
72	421	438	432	454	464
73	416	431	438	453	454
74	502	529	534	560	566
75	423	433	440	460	467
76	416	420	424	436	439
77	474	498	505	526	537
78	482	498	513	536	544
79	431	447	459	478	486
80	411	420	428	450	453
81	472	460	493	528	543
82	505	537	553	568	573
83	487	501	514	535	540
84	494	509	512	538	542
85	465	486	490	510	519
86	442	455	471	491	504
87	534	555	572	596	606
88	435	439	442	464	471
89	481	502	518	536	546
90	480	508	522	539	550
Mean	459.1	474.5	484.9	505.9	513.8
S.D.	37.12	42.49	45.21	46.49	47.46

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	9	10	11	12	13
	Grams	Grams	Grams	Grams	Grams
Group III	125 mg/kg/day				
121	X				
122	X				
123	X				
124	X				
125	X				
126	X				
127	X				
128	X				
129	X				
130	X				
131	467	489	503	519	509
132	488	493	506	529	517
133	X				
134	500	524	542	555	558
135	411	440	453	445	448
136	387	399	416	442	446
137	421	444	443	463	461
138	520	545	554	579	586
139	448	466	472	487	496
140	510	536	537	561	570
141	459	470	478	497	505
142	492	515	518	545	564
143	447	466	477	498	493
144	513	535	549	560	570
145	423	439	440	459	467
146	485	503	514	531	537
147	458	471	481	491	485
148	479	498	505	520	529
149	477	499	503	507	530
150	457	423	458	483	491
Mean	465.4	481.8	492.1	509.0	513.8
S.D.	36.55	40.76	39.36	40.60	42.91

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	9	10	11	12	13
	Grams	Grams	Grams	Grams	Grams
Group IV	500 mg/kg/day				
181	X				
182	X				
183	X				
184	X				
185	X				
186	X				
187	X				
188	X				
189	X				
190	X				
191	384	389	407	414	424
192	435	455	464	484	489
193	446	464	472	495	507
194	351	371	386	402	412
195	453	474	479	516	516
196	429	450	467	478	480
197	385	406	420	425	431
198	385	397	401	422	430
199	448	464	474	487	493
200	499	517	542	573	571
201	510	535	547	554	566
202	X				
203	381	398	405	413	416
204	426	439	455	478	478
205	425	442	458	478	482
206	474	490	487	518	538
207	457	477	488	497	507
208	382	394	395	411	416
209	469	481	492	514	530
210	456	474	487	499	508
Mean	431.3	448.3	459.3	476.7	483.9
S.D.	43.64	45.49	46.52	49.92	50.50

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	9	10	11	12	13
	Grams	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day				
31	X				
32	X				
33	X				
34	X				
35	X				
36	X				
37	X				
38	X				
39	X				
40	X				
41	281	292	299	311	305
42	257	259	264	282	275
43	225	228	228	233	238
44	261	246	273	270	284
45	244	253	264	264	267
46	254	256	262	276	281
47	354	362	377	388	389
48	251	260	273	280	274
49	270	273	270	286	278
50	279	297	301	310	306
51	277	277	294	300	304
52	291	307	324	320	320
53	279	293	296	312	301
54	270	276	278	286	295
55	251	259	260	269	278
56	198	208	210	217	219
57	294	296	310	317	317
58	269	268	273	288	294
59	300	302	309	333	325
60	297	306	307	314	321
Mean	270.1	275.9	283.6	292.8	293.5
S.D.	31.75	33.23	35.47	36.58	35.07

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13
	Grams	Grams	Grams	Grams	Grams
Group II	30 mg/kg/day				
91	X				
92	X				
93	X				
94	X				
95	X				
96	X				
97	X				
98	X				
99	X				
100	X				
101	277	281	283	305	309
102	268	273	283	286	292
103	280	288	290	301	301
104	292	300	302	312	313
105	248	257	266	270	272
106	293	291	313	317	315
107	264	271	275	288	293
108	252	262	266	264	274
109	283	287	282	297	303
110	264	273	273	285	294
111	239	241	241	254	263
112	247	245	247	267	272
113	312	325	326	334	340
114	266	276	283	293	294
115	266	280	284	286	294
116	331	346	364	364	366
117	300	310	312	323	336
118	255	273	273	278	289
119	304	318	332	346	365
120	267	276	279	289	296
Mean	275.4	283.6	288.7	298.0	304.0
S.D.	23.98	26.11	29.23	28.19	28.66

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	9	10	11	12	13
	Grams	Grams	Grams	Grams	Grams
<b>Group III      125 mg/kg/day</b>					
151	X				
152	X				
153	X				
154	X				
155	X				
156	X				
157	X				
158	X				
159	X				
160	X				
161	288	287	301	303	321
162	257	259	258	272	274
163	311	316	324	345	345
164	315	343	350	354	349
165	257	269	272	294	319
166	234	255	252	254	268
167	294	300	306	309	313
168	227	233	238	246	246
169	267	285	288	298	299
170	317	321	334	348	346
171	264	278	291	303	302
172	247	253	253	264	275
173	243	253	252	257	268
174	239	247	250	251	251
175	274	291	301	308	302
176	263	273	285	291	291
177	267	256	253	271	279
178	239	243	248	265	265
179	260	267	271	280	284
180	267	264	272	281	283
Mean	266.5	274.6	280.0	289.7	294.0
S.D.	26.62	28.41	31.56	32.12	30.57

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Body Weights

TRL Study #032-006

## FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	9	10	11	12	13
	Grams	Grams	Grams	Grams	Grams
Group IV	500 mg/kg/day				
211	X				
212	X				
213	X				
214	X				
215	X				
216	X				
217	X				
218	X				
219	X				
220	X				
221	247	255	258	257	267
222	286	296	306	311	310
223	265	288	289	300	307
224	X				
225	274	283	280	297	301
226	295	318	332	349	358
227	285	291	301	318	310
228	242	252	253	267	265
229	262	273	274	281	280
230	289	296	306	322	328
231	250	253	257	270	274
232	198	204	208	210	211
233	267	284	292	298	304
234	260	257	261	279	275
235	261	255	264	266	278
236	230	237	239	250	245
237	284	299	303	314	314
238	265	267	267	277	276
239	258	263	257	274	276
240	259	272	282	283	273
Mean	261.9	270.7	275.2	285.4	286.9
S.D.	22.99	26.21	28.65	31.08	32.23

X Animal dead

**TOXICITY RESEARCH LABORATORIES, LTD.**

**TRL Study #032-006**

**Rat Oral Subchronic Toxicity Study**

**Compound:**

**Normal Butanol**

**APPENDIX C**

**Individual Food Consumption**

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

MALES

ANIMAL NUMBER	PRE- TEST	WEEK	WEEK	WEEK	WEEK
		1	2	3	4
	Grams	Grams	Grams	Grams	Grams
<b>Group I</b>					<b>0 mg/kg/day</b>
1	114	152	174	191	210
2	94	185	208	221	233
3	134	176	193	218	237
4	128	155	177	176	192
5	121	126	156	168	175
6	132	162	181	198	198
7	115	136	163	173	185
8	137	164	192	206	217
9	135	178	190	202	229
10	126	145	160	186	198
11	127	152	170	173	176
12	144	155	186		200
13	145	173	193	198	212
14	116	140	160	160	172
15	146	165	166	178	198
16	139	176	193	196	206
17	122	152	180	199	218
18	123	152	178	198	212
19	149	173	193	221	245
20	115	190	185	202	219
21	137	160	171	185	208
22	136	154	179	197	215
23	132	163	193	189	201
24	138	166	167	186	202
25	121	144	167	172	192
26	132	140	183	212	226
27	134	151	177	181	199
28	132	156	175	193	206
29	130	156	172	206	210
30	131	156	185	197	221
Mean	129.5	158.4	178.9	192.5	207.1
S.D.	11.58	14.62	12.40	15.80	17.74

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

MALES

ANIMAL NUMBER	PRE- TEST	WEEK 1	WEEK 2	WEEK 3	WEEK 4
	Grams	Grams	Grams	Grams	Grams
<b>Group II      30 mg/kg/day</b>					
61	154	181	207	219	244
62	136	158	186	194	211
63	143	163	176	197	
64	141	156	172	188	193
65	134	159	168	184	187
66	138	161	185	199	216
67	144	163	179	206	211
68	170	162	182	205	225
69	134	167	182	187	196
70	141	161	183	193	203
71	134	150	167	188	200
72	130	150	169	180	198
73	145	154	173	182	189
74	143	120	182	208	235
75	140	166	174	183	204
76	138	149	169	186	201
77	153	191	189	205	210
78	133	161	190	202	224
79	135	163	161	182	187
80	133	162	173	182	189
81	136	159	177	206	237
82	143	148	181	197	207
83	147	173	198	212	221
84	141	167	191	215	231
85	145	175	195	221	238
86	147	175	195	198	207
87	126	152	182	207	225
88	135	159	183	191	206
89	143	165	190	209	232
90	138	153	180	192	204
Mean	140.7**	160.8	181.3	197.3	211.4
S.D.	8.41	12.37	10.32	11.88	16.77

\*\* P less than or equal to 0.01

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

MALES

ANIMAL NUMBER	PRE- TEST	WEEK	WEEK	WEEK	WEEK	
		1	2	3	4	
	Grams	Grams	Grams	Grams	Grams	
Group III		125 mg/kg/day				
121	147	171	177	198	207	
122	128	153	175	187	198	
123	140	152	185	196	217	
124	147	188	186	213	221	
125	135	162	175	204	204	
126	134	141	162	180	174	
127	145	171	188	202	211	
128	149	170	184	210	225	
129	132	155	173	182	196	
130	164	169	196	231	203	
131	137	157	173	188	203	
132	141	149	173	199	212	
133	138	X				
134	145	156	184	206	221	
135	129	143	167	188	199	
136	133	143	164	177	189	
137	139	155	170	187	196	
138	161	193	211	237	243	
139	138	164	178	199	206	
140	156	190	208	231	238	
141	162	172	185	207	209	
142	135	165	177	194	213	
143	135	148	162	179	200	
144	137	175	194	207	218	
145	146	162	186	195	205	
146	164	158	194	214	234	
147	146	167	192	201	214	
148	135	160	175	198	215	
149	142	165	183	196	215	
150	143	169	194	202	196	
Mean	142.8**	162.9	181.8	200.3	209.7	
S.D.	10.10	13.27	12.37	15.04	14.62	

\*\* P less than or equal to 0.01

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

MALES

ANIMAL NUMBER	PRE- TEST	WEEK	WEEK	WEEK	WEEK
		1	2	3	4
	Grams	Grams	Grams	Grams	Grams
Group IV	500 mg/kg/day				
181	134	152	178	184	193
182	131	154	166	189	197
183	132	147	168	185	195
184	136	160	177	213	209
185	157	184	192	209	224
186	154	174	183	196	219
187	133	151	165	174	188
188	130	136	155	172	187
189	143	166	181	187	191
190	131	166	179	206	219
191	124	140	154	174	188
192	136	160	156	179	208
193	119	155	176	185	204
194	137	151	168	184	193
195	134	161	153	198	210
196	150	160	154	164	188
197	125	148	155	180	181
198	146	141	174	176	170
199	129	143	172	196	210
200	173	197	198	220	234
201	145	183	207	230	243
202	143	170	180	199	202
203	126	154	173	175	207
204	156	169	178	182	211
205	139	164	161	183	193
206	141	161	167	196	197
207	135	161	191	204	205
208	120	139	146	161	173
209	133	165	171	195	203
210	136	171	183	191	198
Mean	137.6*	159.4	172.0	189.6	201.3
S.D.	11.83	14.12	14.38	15.93	16.28

\* P less than or equal to 0.05

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 FEMALES

ANIMAL NUMBER	PRE- TEST	WEEK 1	WEEK 2	WEEK 3	WEEK 4
	Grams	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day				
31	126	122	127	128	134
32	108	110	119	126	126
33	129	127	133	141	153
34	115	123	129	126	136
35	122	106	125	124	125
36	113	119	125	138	141
37	120	119	131	148	137
38	137	139	150	154	168
39	114	119	130	130	138
40	144	142	154	153	168
41	128	132	143	141	146
42	114	116	119	131	128
43	127	118	117	125	121
44	131	136	130	157	139
45	131	136	129	142	137
46	122	120	133	128	141
47	135	148	176	178	225
48	120	122	136	132	128
49	121	121	132	148	161
50	127	131	130	169	149
51	117	132	136	137	146
52	120	130	144	142	150
53	126	130	138	138	148
54	142	132	132	130	141
55	120	123	125	151	134
56	114	104	116	110	117
57	133	149	140	144	155
58	135	139	144	151	163
59	146	159	167	175	181
60	141	133	144	161	165
Mean	125.9	127.9	135.1	141.9	146.7
S.D.	10.05	12.55	13.62	15.88	21.29

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

FEMALES

ANIMAL NUMBER	PRE- TEST	WEEK	WEEK	WEEK	WEEK
		1	2	3	4
	Grams	Grams	Grams	Grams	Grams
Group II      30 mg/kg/day					
91	128	132	138	147	156
92	140	157	148	157	181
93	153	135	128	153	155
94	158	150	151	162	163
95	121	106	119	124	145
96	123	128	134	146	158
97	120	123	139	147	153
98	121	133	138	155	146
99	120	127	138	139	156
100	131	138	129	156	160
101	132	156	136	142	155
102	114	125	131	144	145
103	136	129	155	173	162
104	134	139	141	150	161
105	135	132	144	142	151
106	122	130	136	144	151
107	140	148	148	157	145
108	119	138	152	152	155
109	137	135	138	144	155
110	126	126	131		146
111	121	110	116	119	135
112	118	115	127	135	145
113	140	150	150	159	176
114	128	135	138	142	145
115	117	121	133	142	158
116	128	155	186	195	209
117	136	127	139	152	155
118	132	132	137	146	148
119	124	135	136	143	154
120	127	142	139	134	150
Mean	129.4	133.6	139.2	148.3	155.8
S.D.	10.32	12.63	12.61	14.11	13.62

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

FEMALES

ANIMAL NUMBER	PRE- TEST	WEEK 1 Grams	WEEK 2 Grams	WEEK 3 Grams	WEEK 4 Grams
<b>Group III      125 mg/kg/day</b>					
151	135	125	139	136	138
152	124	120	130	129	135
153	145	151	164	178	173
154	133	140	146	142	139
155	146	141	156	151	142
156	111	114	120	118	126
157	137	143	142	158	153
158	118	109	106	119	119
159	132	135	138	147	161
160	125	136	142	154	158
161	122	129	140	152	156
162	125	124	126	137	149
163	149	148	142	146	153
164	128	143	144	153	156
165	148	161	135	127	136
166	114	111	111	130	128
167	133	129	130	147	152
168	122	112	122	117	121
169	125	136	148	142	162
170	130	141	139	154	158
171	131	136	141	140	143
172	128	123	125	141	149
173	121	115	127	130	142
174	113	118	113	124	135
175	146	134	140	136	148
176	121	114	128	133	145
177	141	137	142	141	163
178	119	125	137	149	160
179	120	125	124	124	139
180	134	132	142	149	152
Mean	129.2	130.2	134.6	140.1	146.4
S.D.	10.69	12.97	12.85	13.70	13.12

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

FEMALES

ANIMAL NUMBER	PRE- TEST	WEEK	WEEK	WEEK	WEEK
		1	2	3	4
	Grams	Grams	Grams	Grams	Grams
<b>Group IV      500 mg/kg/day</b>					
211	130	145	128	163	122
212	117	121	126	134	142
213	124	139	141	145	158
214	113	124	122	123	138
215	130	137	148	145	163
216	123	134	139		144
217	133	139	150	146	155
218	117	118	124	121	130
219	114	133	138	143	151
220	126	135	149	142	150
221	130	129	134	132	132
222	127	138	139	142	154
223	118	138	138	157	162
224	122	129	142	138	X
225	129	147	145	156	169
226	127	135	140	146	157
227	123	134	138	147	149
228	125	132	135	135	155
229	111	121	130	134	142
230	131	144	153	158	171
231	106	113	117	126	139
232	122	117	116	116	117
233	115	125	122	138	147
234	122	125	128	138	138
235	117	125	142	139	145
236	119	120	133	125	144
237	126	128	141	141	150
238	116	126	143	133	146
239	124	123	133	129	145
240	119	121	148	159	161
Mean	121.9	129.8	136.1	139.7	147.4
S.D.	6.59	8.85	9.87	11.86	12.69

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	5	6	7	8	9
	Grams	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day				
1	198	198	X		
2	206	204	X		
3	230	244	X		
4	192	210	X		
5	177	178	X		
6	196	205	X		
7	189	188	X		
8	210	225	X		
9	219	227	X		
10	200	222	X		
11	185	190	185	187	182
12	182	199	195	195	193
13	208	209	217	202	192
14	174	173	166	166	161
15	198	193	191	195	189
16	196	210	200	214	202
17	206	202	201	210	194
18	209	211	210	205	216
19	234	243	245	243	218
20	207	212	210	215	213
21	190	190	188	186	180
22	205	221	212	212	208
23	197	202	193	200	193
24	184	194	191	190	188
25	200	214	207	200	193
26	219	237	217	235	221
27	188	225	216	193	185
28	198	214	198	206	201
29	208	218	209	202	198
30	208	223	223	227	221
Mean	200.4	209.4	203.7	204.2	197.4
S.D.	14.12	17.53	16.79	17.64	15.48

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 MALES

ANIMAL NUMBER	WEEK 5 Grams	WEEK 6 Grams	WEEK 7 Grams	WEEK 8 Grams	WEEK 9 Grams
<b>Group II      30 mg/kg/day</b>					
61	230	248	X		
62	206	203	X		
63	207	201	X		
64	185	202	X		
65	190	194	X		
66	209	229	X		
67	198	206	X		
68	225	220	X		
69	198	207	X		
70	202	208	X		
71	192	193	178	180	175
72	189	191	187	190	175
73	186	197	186	189	178
74	234	243	233	240	226
75	194	203	193	198	188
76	189	206	189	194	189
77	226	213	208	218	204
78	228	227	204	197	186
79	180	199	182	188	178
80	194	201	193	190	182
81	221	236	223	227	190
82	201	238	242	262	242
83	222	228	224	223	220
84	225	228	228	239	219
85	242	226	220	218	213
86	196	209	193	205	166
87	228	229	227	228	216
88	188	205	191	208	193
89	239	227	219	223	192
90	203	213	212	223	226
Mean	207.6	214.3	206.6	212.0	197.9
S.D.	18.28	15.91	19.34	21.57	21.28

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9
	Grams	Grams	Grams	Grams	Grams
Group III      125 mg/kg/day					
121	200	209	X		
122	210	207	X		
123	217	224	X		
124	226	230	X		
125	205	212	X		
126	169	185	X		
127	210	215	X		
128	217	205	X		
129	200	208	X		
130	197	209	X		
131	214	233	214	248	211
132	213	226	220	221	211
133	X				
134	223	227	213	227	201
135	201	220	190	174	187
136	189	192	184	190	188
137	205	209	199	209	189
138	246	257	228	250	252
139	211	218	206	217	207
140	232	240	235	253	245
141	213	223	210	230	223
142	206	222	200	231	211
143	186	206	189	206	196
144	226	234	223	234	233
145	198	196	175	192	170
146	246	225	210	206	203
147	211	221	203	218	195
148	216	226	215	229	207
149	221	223	215	220	204
150	206	218	222	228	220
Mean	210.8*	217.9	207.9	220.2	208.1
S.D.	16.26	14.73	15.61	20.70	20.24

\*P less than or equal to 0.05

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

MALES

ANIMAL NUMBER	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9
	Grams	Grams	Grams	Grams	Grams
<b>Group IV      500 mg/kg/day</b>					
181	174	191	X		
182	202	202	X		
183	182	181	X		
184	200	197	X		
185	215	239	X		
186	223	218	X		
187	192	206	X		
188	181	169	X		
189	183	198	X		
190	206	223	X		
191	183	191	180	187	174
192	204	213	213	228	223
193	195	205	199	218	209
194	190	196	188	125	176
195	203	206	190	194	198
196	195	213	196	200	188
197	173	188	173	174	173
198	168	178	172	182	165
199	202	202	202	219	208
200	227	233	226	245	197
201	226	228	223	238	224
202	186	202	X		
203	188	153	153	176	191
204	189	192	185	193	193
205	182	190	194	192	185
206	209	210	211	222	217
207	203	217	205	214	217
208	176	181	180	182	174
209	203	213	206	220	216
210	200	206	208	220	201
Mean	195.3	201.4	194.9	201.5	196.3
S.D.	15.47	18.67	18.53	28.10	18.58

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	5	6	7	8	9
	Grams	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day				
31	130	140	X		
32	128	142	X		
33	150	151	X		
34	135	139	X		
35	141	134	X		
36	142	146	X		
37	140	140	X		
38	156	170	X		
39	133	149	X		
40	159	157	X		
41	151	164	153	158	151
42	125	139	136	138	152
43	125	130	127	128	126
44	155	159	146	159	140
45	145	142	137	152	149
46	135	141	131	140	137
47	202	202	179	198	205
48	135	132	127	136	135
49	161	165	171	170	178
50	132	152	151	151	167
51	136	152	136	141	141
52	152	163	163	162	151
53	155	148	136	141	137
54	134	157	141	166	165
55	137	144	141	147	149
56	115	115	109	108	95
57	157	177	154	159	163
58	147	151	151	153	148
59	173	77	176	184	179
60	176	178	169	178	179
Mean	145.4	148.5	146.7	153.5	152.4
S.D.	17.78	21.63	18.26	20.40	23.42

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	5	6	7	8	9
	Grams	Grams	Grams	Grams	Grams
Group II	30 mg/kg/day				
91	136	158	X		
92	167	185	X		
93	162	164	X		
94	156	176	X		
95	143	144	X		
96	159	147	X		
97	157	160	X		
98	144	160	X		
99	147	172	X		
100	157	175	X		
101	153	152	157	165	143
102	147	163	152	152	159
103	169	168	152	180	178
104	166	172	169	196	176
105	141	158	151	151	138
106	150	152	150	161	148
107	143	143	143	147	140
108	161	159	158	161	161
109	150	106	146	158	156
110	154	205	142	164	154
111	129	132	132	158	135
112	136	161	155	152	155
113	160	175	167	202	176
114	147	152	152	158	155
115	150	157	143	164	156
116	196	195	160	171	158
117	164	156	156	183	160
118	146	147	138	171	171
119	162	148	164	193	181
120	144	145	136	158	113
Mean	153.2	159.6	151.2	167.3*	155.7
S.D.	12.85	18.69	10.13	15.76	16.69

\* P less than or equal to 0.05

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	5	6	7	8	9
	Grams	Grams	Grams	Grams	Grams
Group III	125 mg/kg/day				
151	138	158	X		
152	135	132	X		
153	180	207	X		
154	142	139	X		
155	157	142	X		
156	135	139	X		
157	158	183	X		
158	117	130	X		
159	154	168	X		
160	160	160	X		
161	151	178	143	153	135
162	147	155	145	165	149
163	164	173	176	175	160
164	178	179	154	209	196
165	138	148	151	157	141
166	124	151	143	130	137
167	158	171	154	179	177
168	126	137	118	148	142
169	162	173	166	167	136
170	172	179	186	198	187
171	137	156	145	158	148
172	157	144	133	153	137
173	146	148	143	157	147
174	69	154	141	140	128
175	150	173	147	159	156
176	154	166	160	172	156
177	154	181	190	176	154
178	156	170	151	165	145
179	138	141	139	159	153
180	149	173	174	169	147
Mean	146.9	160.3*	153.0	164.5	151.6
S.D.	20.90	18.29	17.90	18.04	17.47

\* P less than or equal to 0.05

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006

FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK	WEEK
	5	6	7	8	9
	Grams	Grams	Grams	Grams	Grams
Group IV	500 mg/kg/day				
211	126	140	X		
212	140	161	X		
213	156	162	X		
214	148	143	X		
215	165	187	X		
216	141	177	X		
217	147	160	X		
218	127	131	X		
219	155	155	X		
220	163	182	X		
221	143	153	139	142	149
222	172	170	148	176	162
223	168	169	172	182	151
224	X				
225	149	161	137	151	156
226	146	170	154	183	168
227	157	170	160	170	154
228	171	167	146	163	144
229	156	168	147	165	145
230	168	177	162	172	153
231	131	131	123	131	143
232	115	139	125	123	125
233	150	163	164	192	192
234	137	148	138	151	148
235	143	162	164	157	174
236	142	135	136	151	137
237	158	158	159	159	156
238	148	152	149	164	150
239	143	165	150	158	135
240	156	191	171	165	158
Mean	149.0	160.2	149.7	160.8	152.6
S.D.	13.98	15.82	14.28	17.31	14.86

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK
	10	11	12	13
	Grams	Grams	Grams	Grams

Group I 0 mg/kg/day

1	X			
2	X			
3	X			
4	X			
5	X			
6	X			
7	X			
8	X			
9	X			
10	X			
11	192	186	216	169
12	211	204	242	201
13	210	196	227	197
14	175	176	196	157
15	200	196	216	185
16	226	226	252	217
17	190	182	209	178
18	229	213	257	200
19	246	232	244	206
20	228	209	243	226
21	205	194	208	179
22	223	206	242	203
23	203	179	216	175
24	206	178	213	183
25	208	204	219	192
26	254	229	251	226
27	212	191	221	202
28	223	200	228	195
29	218	160	226	212
30	244	230	247	209
Mean	215.2	199.6	228.7	195.6
S.D.	19.67	19.90	17.39	18.50

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK
	10	11	12	13
	Grams	Grams	Grams	Grams
Group II	30 mg/kg/day			
61	X			
62	X			
63	X			
64	X			
65	X			
66	X			
67	X			
68	X			
69	X			
70	X			
71	189	177	219	191
72	199	177	211	184
73	198	183	207	174
74	261	232	263	230
75	194	184	216	188
76	188	171	195	177
77	232	206	246	203
78	206	188	233	199
79	189	178	201	181
80	194	184	202	173
81	107	219	263	219
82	275	241	245	217
83	237	222	246	204
84	235	209	255	216
85	235	201	242	213
86	181	176	217	197
87	244	238	254	218
88	207	179	226	197
89	221	204	230	204
90	245	230	247	223
Mean	211.9	200.0	230.9	200.4
S.D.	36.52	23.37	21.50	17.26

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 MALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK
	10	11	12	13
	Grams	Grams	Grams	Grams

Group III 125 mg/kg/day

121	X			
122	X			
123	X			
124	X			
125	X			
126	X			
127	X			
128	X			
129	X			
130	X			
131	248	219	235	180
132	222	208	243	200
133	X			
134	235	215	237	200
135	209	194	179	161
136	198	191	218	200
137	218	176	201	198
138	273	245	282	219
139	226	198	222	191
140	270	223	245	224
141	224	202	235	203
142	219	194	239	207
143	207	185	214	182
144	239	220	219	211
145	190	172	174	167
146	224	202	195	203
147	212	199	184	168
148	225	195	190	197
149	219	X		
150	158	201	234	206
Mean	221.9	202.2	219.2	195.4
S.D.	26.14	17.65	27.98	17.54

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 MALES

ANIMAL NUMBER	WEEK 10	WEEK 11	WEEK 12	WEEK 13
	Grams	Grams	Grams	Grams
Group IV	500 mg/kg/day			
181	X			
182	X			
183	X			
184	X			
185	X			
186	X			
187	X			
188	X			
189	X			
190	X			
191	179	173	186	175
192	241	215	258	223
193	224	200	235	208
194	201	185	208	190
195	208	200	240	206
196	214	203	213	190
197	185	176	192	171
198	183	158	199	176
199	235	204	219	193
200	251	236	272	219
201	249	224	227	209
202	X			
203	174	167	183	159
204	205	199	222	191
205	205	197	217	187
206	233	195	229	214
207	231	213	221	199
208	191	168	187	167
209	221	206	230	208
210	238	212	232	210
Mean	214.1	196.4	219.5	194.5
S.D.	24.34	20.63	23.79	18.50

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK
	10	11	12	13
	Grams	Grams	Grams	Grams
Group I	0 mg/kg/day			
31	X			
32	X			
33	X			
34	X			
35	X			
36	X			
37	X			
38	X			
39	X			
40	X			
41	164	148	168	137
42	139	127	155	120
43	129	118	137	115
44	142	147	175	153
45	162	143	179	151
46	145	149	170	136
47	201	184	214	171
48	140	139	157	128
49	179	169	200	166
50	174	155	174	149
51	141	144	169	148
52	171	184	169	130
53	159	146	168	126
54	173	143	183	158
55	152	140	180	158
56	112	200	132	110
57	170	158	173	142
58	158	147	180	146
59	186	178	208	158
60	177	168	192	167
Mean	158.7	154.4	174.2	143.5
S.D.	21.35	20.44	20.33	17.72

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 FEMALES

ANIMAL NUMBER	WEEK 10	WEEK 11	WEEK 12	WEEK 13
	Grams	Grams	Grams	Grams
Group II	30 mg/kg/day			
91	X			
92	X			
93	X			
94	X			
95	X			
96	X			
97	X			
98	X			
99	X			
100	X			
101	162	165	180	148
102	162	149	167	143
103	207	168	184	166
104	192	172	187	163
105	163	148	162	154
106	164	158	171	142
107	157	140	168	141
108	180	166	164	153
109	160	144	171	137
110	172	144	170	159
111	140	139	157	136
112	143	142	169	157
113	195	159	155	161
114	165	163	149	145
115	171	147	136	148
116	183	193	155	141
117	186	168	166	161
118	193	172	154	173
119	212	196	199	220
120	153	149	144	126
Mean	173.0	159.1	165.4	153.7
S.D.	19.93	16.37	15.01	19.50

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 FEMALES

ANIMAL NUMBER	WEEK	WEEK	WEEK	WEEK
	10	11	12	13
	Grams	Grams	Grams	Grams
Group III	125 mg/kg/day			
151	X			
152	X			
153	X			
154	X			
155	X			
156	X			
157	X			
158	X			
159	X			
160	X			
161	148	136	146	144
162	164	137	163	132
163	176	151	180	165
164	220	197	199	151
165	162	148	184	194
166	166	132	132	138
167	166	149	152	146
168	146	126	128	130
169	175	165	153	153
170	209	183	205	171
171	124	201	178	153
172	206	85	183	153
173	152	140	158	147
174	143	131	134	125
175	170	149	178	155
176	176	155	167	150
177	144	148	192	152
178	164	147	193	183
179	158	150	166	145
180	164	154	169	135
Mean	166.7	149.2	168.0	151.1
S.D.	23.44	25.26	22.37	17.06

X Animal dead

## Rat Oral Subchronic Toxicity Study of Normal Butanol

## Individual Food Consumptions

TRL Study #032-006 FEMALES

ANIMAL NUMBER	WEEK 10	WEEK 11	WEEK 12	WEEK 13
	Grams	Grams	Grams	Grams
Group IV	500 mg/kg/day			
211	X			
212	X			
213	X			
214	X			
215	X			
216	X			
217	X			
218	X			
219	X			
220	X			
221	147	131	167	148
222	162	156	178	150
223	182	161	170	159
224	X			
225	162	140	178	153
226	200	185	214	182
227	164	156	174	136
228	156	141	165	142
229	169	146	167	133
230	167	140	184	162
231	131	129	147	126
232	138	123	137	124
233	200	175	194	175
234	159	154	175	139
235	168	150	182	168
236	142	141	162	137
237	174	149	174	156
238	161	140	153	132
239	144	123	158	132
240	185	158	165	144
Mean	163.7	147.3	170.7	147.3
S.D.	19.08	16.19	17.01	16.46

X Animal dead

**TOXICITY RESEARCH LABORATORIES, LTD.**

**TRL Study #032-006**

**Rat Oral Subchronic Toxicity Study**

**Compound:**

**Normal Butanol**

**APPENDIX D**

**Ophthalmologic Evaluation**

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
001	M	0	N	--a
002	M	0	N	--a
003	M	0	N	--a
004	M	0	N	--a
005	M	0	N	--a
006	M	0	N	--a
007	M	0	N	--a
008	M	0	N	--a
009	M	0	N	--a
010	M	0	N	--a
011	M	0	N	N
012	M	0	N	N
013	M	0	N	N
014	M	0	N	N
015	M	0	N	N

D-1

N = Normal

OU = Both eyes

NOP = No Other Ocular Pathology

OD = Right eye

OS = Left eye

<sup>a</sup> Sacrificed at interim

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
016	M	0	N	N
017	M	0	N	N
018	M	0	N	N
019	M	0	N	N
020	M	0	N	OS-N; OD-Chorioretinal hypoplasia, NOP
021	M	0	N	N
022	M	0	N	N
023	M	0	N	N
024	M	0	N	N
025	M	0	N	N
026	M	0	N	N
027	M	0	N	N
028	M	0	N	N
029	M	0	N	N
030	M	0	N	N

D  
2

N = Normal

OU = Both eyes

NOP = No Other Ocular Pathology

OD = Right eye

OS = Left eye

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
031	F	0	N	--a
032	F	0	N	--a
033	F	0	N	--a
034	F	0	N	--a
035	F	0	N	--a
036	F	0	N	--a
037	F	0	N	--a
038	F	0	N	--a
039	F	0	N	--a
040	F	0	N	--a
041	F	0	N	N
042	F	0	N	N
043	F	0	N	N
044	F	0	N	N
045	F	0	N	N

D-3

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

a

Sacrificed at interim

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
046	F	0	N	N
047	F	0	N	N
048	F	0	N	N
049	F	0	N	N
050	F	0	N	N
051	F	0	N	N
052	F	0	N	N
053	F	0	N	N
054	F	0	N	N
055	F	0	N	N
056	F	0	N	N
057	F	0	N	N
058	F	0	N	N
059	F	0	N	N
060	F	0	N	N

D-4

N = Normal

OU = Both eyes

NOP = No Other Ocular Pathology

OD = Right eye

OS = Left eye

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
061	M	30	N	--a
062	M	30	N	--a
063	M	30	N	--a
064	M	30	N	--a
065	M	30	N	--a
066	M	30	N	--a
067	M	30	N	--a
068	M	30	N	--a
069	M	30	N	--a
070	M	30	N	--a
071	M	30	N	N
072	M	30	N	N
073	M	30	N	N
074	M	30	N	N
075	M	30	N	N

D5

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

a

Sacrificed at interim

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
076	M	30	N	N
077	M	30	N	N
078	M	30	N	N
079	M	30	N	N
080	M	30	N	N
081	M	30	N	N
082	M	30	N	N
083	M	30	N	N
084	M	30	N	N
085	M	30	N	N
086	M	30	N	N
087	M	30	N	OS-N; OD-Chorioretinal hypoplasia, NOP
088	M	30	N	N
089	M	30	N	N
090	M	30	N	N

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
091	F	30	N	--a
092	F	30	N	--a
093	F	30	N	--a
094	F	30	N	--a
095	F	30	N	--a
096	F	30	N	--a
097	F	30	N	--a
098	F	30	N	--a
099	F	30	N	--a
100	F	30	N	--a
101	F	30	N	N
102	F	30	N	N
103	F	30	N	N
104	F	30	N	OS-N; OD-Retinal hyaloid, NOP
105	F	30	N	N

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

<sup>a</sup> Sacrificed at interim

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
106	F	30	N	N
107	F	30	N	N
108	F	30	N	N
109	F	30	N	N
110	F	30	N	N
111	F	30	N	N
112	F	30	N	N
113	F	30	N	N
114	F	30	N	N
115	F	30	N	N
116	F	30	N	N
117	F	30	N	N
118	F	30	N	N
119	F	30	N	N
120	F	30	N	N

D-8

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
121	M	125	N	--a
122	M	125	N	--a
123	M	125	N	--a
124	M	125	N	--a
125	M	125	N	--a
126	M	125	N	--a
127	M	125	N	--a
128	M	125	N	--a
129	M	125	N	--a
130	M	125	N	--a
131	M	125	N	N
132	M	125	N	N
133	M	125	N	--b
134	M	125	N	N
135	M	125	N	N

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

a Sacrificed at interim

b Found dead

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
136	M	125	N	N
137	M	125	N	N
138	M	125	N	N
139	M	125	N	N
140	M	125	N	OS-N; OD-Chorioretinal hypoplasia, NOP
141	M	125	N	N
142	M	125	N	N
143	M	125	N	N
144	M	125	N	N
145	M	125	N	N
146	M	125	N	N
147	M	125	N	N
148	M	125	N	OS-N; OD-Chorioretinal hypoplasia, NOP
149	M	125	N	N
150	M	125	N	N

D-10

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
151	F	125	N	-- a
152	F	125	N	-- a
153	F	125	N	-- a
154	F	125	N	-- a
155	F	125	N	-- a
156	F	125	N	-- a
157	F	125	N	-- a
158	F	125	N	-- a
159	F	125	N	-- a
160	F	125	N	-- a
161	F	125	N	N
162	F	125	N	N
163	F	125	N	N
164	F	125	N	N
165	F	125	N	OD-N; OS-Chorioretinal hypoplasia, NOP

D-11

N = Normal

OU = Both eyes

NOP = No Other Ocular Pathology

OD = Right eye

OS = Left eye

a

Sacrificed at interim

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
166	F	125	N	N
167	F	125	N	OS-N; OD-Posterior capsular and cortical cataract, NOP
168	F	125	N	N
169	F	125	N	N
170	F	125	N	N
171	F	125	N	N
172	F	125	N	N
173	F	125	N	N
174	F	125	N	N
175	F	125	N	N
176	F	125	N	N
177	F	125	N	N
178	F	125	N	N
179	F	125	N	N
180	F	125	N	N

D-12

N = Normal

OU = Both eyes

NOP = No Other Ocular Pathology

OD = Right eye

OS = Left eye

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
181	M	500	N	--a
182	M	500	N	--a
183	M	500	N	--a
184	M	500	N	--a
185	M	500	N	--a
186	M	500	N	--a
187	M	500	N	--a
188	M	500	N	--a
189	M	500	N	--a
190	M	500	N	--a
191	M	500	N	N
192	M	500	N	N
193	M	500	N	N
194	M	500	N	N
195	M	500	N	N

D-1E

N = Normal

OU = Both eyes

NOP = No Other Ocular Pathology

OD = Right eye

OS = Left eye

<sup>a</sup> Sacrificed at interim

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
196	M	500	N	N
197	M	500	N	N
198	M	500	N	N
199	M	500	N	N
200	M	500	N	N
201	M	500	N	N
202	M	500	N	--a
203	M	500	N	N
204	M	500	N	N
205	M	500	N	N
206	M	500	N	N
207	M	500	N	N
208	M	500	N	N
209	M	500	N	N
210	M	500	N	N

D-14

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

a

Moribund sacrifice

**Rat Oral Subchronic Toxicity Study of Normal Butanol**  
**Ophthalmologic Examination**

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
211	F	500	N	--a
212	F	500	N	--a
213	F	500	N	--a
214	F	500	N	--a
215	F	500	N	--a
216	F	500	N	--a
217	F	500	N	--a
218	F	500	N	--a
219	F	500	N	--a
220	F	500	N	--a
221	F	500	N	N
222	F	500	N	N
223	F	500	N	OD-N; OS-Chorioretinal hypoplasia, NOP
224 <sup>b</sup>	F	500	N	
225	F	500	N	OS-N; OD-Chorioretinal hypoplasia, NOP

D-15

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

a Sacrificed at interim

b Found dead

Rat Oral Subchronic Toxicity Study of Normal Butanol  
Ophthalmologic Examination

TRL Study #032-006

<u>Rat #</u>	<u>Sex</u>	<u>Dose Level (mg/kg/day)</u>	<u>Pretreatment</u>	<u>Week 13</u>
226	F	500	N	N
227	F	500	N	OS-N; OD-Chorioretinal hypoplasia, NOP
228	F	500	N	N
229	F	500	N	N
230	F	500	N	N
231	F	500	N	N
232	F	500	N	N
233	F	500	N	N
234	F	500	N	OU-Keratitis, NOP
235	F	500	N	N
236	F	500	N	N
237	F	500	N	N
238	F	500	N	N
239	F	500	N	N
240	F	500	N	N

D-16

N = Normal

NOP = No Other Ocular Pathology

OU = Both eyes

OD = Right eye

OS = Left eye

**TOXICITY RESEARCH LABORATORIES, LTD.**

**TRL Study #032-006**

**Rat Oral Subchronic Toxicity Study**

**Compound:**

**Normal Butanol**

**APPENDIX E**

**Clinical Pathology Methodology**

1. Tests Performed

<u>Hematology</u>	<u>Units</u>
Hematocrit value (PCV)	%
Hemoglobin concentration (HGB)	g/dl
Erythrocyte count (RBC)	( $\times 10^6/\mu\text{l}$ )
Mean corpuscular volume (MCV)	fL
Mean corpuscular hemoglobin (MCH)	pg
Mean corpuscular hemoglobin concentration (MCHC)	g/dl
Total leucocyte count (WBC)	( $\times 10^3/\mu\text{l}$ )
Absolute differential leucocyte count (Neut, Lymph, Mono, Eo, Baso)	( $\times 10^3/\mu\text{l}$ )
Percent differential leucocyte count (Neut, Lymph, Mono, Eo, Baso)	%
Platelet count (PLT)	( $\times 10^3/\mu\text{l}$ )

Blood Chemistry

Serum alkaline phosphatase (Alk Phos)	U/l
Serum glutamate pyruvate transaminase (SGPT)	U/l
Serum glutamate oxalacetate transaminase (SGOT)	U/l
Glucose (Gluc)	mg/dl
Urea nitrogen (BUN)	mg/dl
Total serum protein (TP)	g/dl
Serum albumin (Alb)	g/dl
Globulin	g/dl
Albumin/Globulin ratio (A/G)	--
Sodium (Na)	meq/l
Potassium (K)	meq/l
Chloride (Cl)	mmol/l
Calcium (Ca)	mg/dl
Creatinine	mg/dl
Inorganic phosphate (Phos.)	mg/dl
Total serum bilirubin (Tot. Bili.)	mg/dl
Total serum cholesterol (Chol)	mg/dl
Total carbon dioxide ( $\text{TCO}_2$ )	mmol/l

Urinalysis

pH	
Specific gravity	
Glucose	(1/20, 1/10, 1/4, 1/2, or 1 g/dl)
Protein Chemstrip	(trace to 3+)
Supernatant	(trace to 4+)
Ketones	(1+ to 3+)
Bilirubin	(1+ to 3+)
Microscopy of sediment	(#/HPF, #/LPF)
Bacteria	(1+ to 3+)
Urobilinogen	(1,4,8 or 12 mg/

2. Instrumentation

- a. A system of Coulter instruments was used to obtain hematology values. The system includes:
- 1) Coulter Counter Model Z<sub>F</sub> which is used for RBC and WBC determinations.
  - 2) Coulter MHR - MCV/Hct/RBC computer which is electrically attached to the Model Z<sub>F</sub> for RBC corrected counts, MCV determinations and Hematocrit calculation.
  - 3) Coulter Diluter II which is an automatic diluter used for the RBC and WBC dilutions.
  - 4) Coulter Hemoglobinometer which is used for determining hemoglobin values from the WBC dilution.
  - 5) Coulter Thrombocounter-C which is used for platelet counts.
- b. Coagulation testing was done on the MLA (Medical Laboratory Automation, Inc.) Electra 750.
- c. Chemistry determinations are performed on a system of three instruments.
- 1) The IL 443 Flame Photometer was used for the quantitative determination of sodium and potassium in serum.
  - 2) The IL 446 Analyzer was used to measure chloride and TCO<sub>2</sub> in serum.
  - 3) The IL Multistat III Micro Centrifugal Analyzer (MCA) was used for the following tests:

<u>Test</u>	<u>MCA Reference Number</u>	<u>Sample size (<math>\mu</math>l)</u>
Glucose	IL <sup>a</sup> 35162-9-83	3
BUN (Urea Nitrogen)	IL35161-9-83	2
Total Protein	IL35173-12-84	5
Albumin	IL35174-4-85	3
Alk. Phosphatase	GD <sup>b</sup> 4619-11-81	4
SGOT	IL35165-9-83	15
SGPT	IL35166-9-83	15
Cholesterol	BI <sup>c</sup> 015-245444-6-83	2
Total Bilirubin	IL35182-9-83	20
Calcium	IL35170-8-84	4
Inorganic Phosphate	IL35172-9-83	3
Creatinine	IL35164-9-83	12

- d. Urine pH, glucose, Ketones, proteins, urobilinogen, and bilirubin were determined with Bio-Dynamics Chemstrip 9. In addition, a confirmatory test for protein was done using a 20% sulfosalicylic acid precipitation test. Specific gravity was determined using an American Optical refractometer.

- 
- a Instrumentation Laboratory Inc., 113 Hartwell Avenue, Lexington, MA 02173.
- b Gilford Diagnostics, 16035 Industrial Parkway SW, Cleveland, OH 44135.
- c Beckman Instruments, Inc., Fullerton, CA 92634.

TOXICITY RESEARCH LABORATORIES, LTD.

TRL Study #032-006

Rat Oral Subchronic Toxicity Study

Compound:

Normal Butanol

APPENDIX F

Normal Hematology and Serum Chemistry Ranges  
for Rats at Toxicity Research Laboratories, Ltd.

Toxicity Research Laboratories, Ltd.  
 HEMATOLOGY NORMALS<sup>a</sup> - RAT (Sprague Dawley - CD)  
 Cardiac Blood  
 Age: 30-91 days old

TRL Study #032-006

	<u>Unit</u>	<u>n</u>	<u>Mean</u>	<u>Range (<math>\pm 2SD</math>)</u>	<u>CV</u>	<u>Instrumentation</u>
RBC	$(\times 10^6/\mu l)$					Coulter <sup>b</sup>
Male		70	6.84	5.62 - 8.05	8.91	
Female		69	6.56	5.57 - 7.55	7.55	
PCV	%					Coulter
Male		70	42.25	36.83 - 47.66	6.41	
Female		69	39.75	35.44 - 44.06	5.42	
Hgb	g/dl					Coulter
Male		70	15.54	13.40 - 17.67	6.87	
Female		69	15.17	13.15 - 17.20	6.68	
WBC	$(\times 10^3/\mu l)$					Coulter
Male		70	12.69	5.19 - 20.20	29.57	
Female		69	10.04	3.50 - 16.59	32.59	
MCV	fL					Coulter
Male		70	62.74	56.63 - 68.86	4.87	
Female		69	61.59	55.94 - 67.24	4.59	
MCH	pg					Calculation <sup>c</sup>
Male		70	22.79	20.66 - 24.93	4.69	
Female		69	23.17	21.13 - 25.20	4.39	
MCHC	g/dl					Calculation <sup>d</sup>
Male		70	36.78	34.68 - 38.88	2.85	
Female		69	38.17	35.30 - 41.04	3.76	
PLT	$(10^3/\mu l)$					Coulter Thrombo-counter-C
Male		44	1060.48	488.62 - 1632.34	26.96	
Female		45	1036.22	533.58 - 1538.86	24.25	

<sup>a</sup> Data collected May 1980 - July 1983.<sup>b</sup> Coulter ZF with Model MHR MCV/Hct/RBC computer.<sup>c</sup> MCH =  $\frac{\text{Hgb} \times 10}{\text{RBC}}$ <sup>d</sup> MCHC =  $\frac{\text{Hgb} \times 100}{\text{PCV}}$

Toxicity Research Laboratories, Ltd.  
 SERUM CHEMISTRY NORMALS<sup>a</sup> - RAT (Sprague Dawley - CD)  
 Cardiac Blood  
 Age: 30-91 days old

TRL Study #032-006

	<u>Unit</u>	<u>n</u>	<u>Mean</u>	<u>Range (<math>\pm 2SD</math>)</u>	<u>CV</u>	<u>Instrumentation</u>
Glucose	mg/dl					MCA <sup>b</sup>
Male		70	268.20	92.92 - 443.49	32.68	
Female		69	237.89	82.39 - 393.38	32.68	
BUN	mg/dl					MCA
Male		70	16.31	10.35 - 22.27	18.27	
Female		69	17.54	9.25 - 25.83	23.64	
Total Protein	g/dl					MCA
Male		70	6.30	5.44 - 7.16	6.80	
Female		69	6.37	5.36 - 7.38	7.93	
Albumin	g/dl					MCA
Male		70	4.32	3.77 - 4.86	6.30	
Female		69	4.41	3.90 - 4.92	5.74	
Alk. Phos.	U/l					MCA
Male		70	201.34	60.42 - 342.25	34.99	
Female		69	144.48	35.76 - 253.21	37.62	
SGOT	U/l					MCA
Male		70	55.89	34.79 - 76.99	18.88	
Female		69	52.90	36.26 - 69.55	15.73	
SGPT	U/l					MCA
Male		70	26.49	11.61 - 41.36	28.09	
Female		69	23.69	9.49 - 37.90	29.97	
Na	meq/l					IL 443 <sup>c</sup>
Male		64	146.96	143.65 - 150.27	1.13	
Female		62	145.89	139.82 - 151.96	2.08	
K	meq/l					IL 443
Male		64	7.26	4.73 - 9.79	17.41	
Female		62	7.37	5.60 - 9.13	11.98	

<sup>a</sup> Data collected May 1980 - July 1983.

<sup>b</sup> MCA = IL MCA Multistat

<sup>c</sup> IL 443 = Flame Photometer

Toxicity Research Laboratories, Ltd.  
 SERUM CHEMISTRY NORMALS - RAT (Sprague Dawley - CD)  
 Cardiac Blood  
 Age: 30-91 days old

TRL Study #032-006

	<u>Unit</u>	<u>n</u>	<u>Mean</u>	<u>Range (<math>\pm</math> 2SD)</u>	<u>CV</u>	<u>Instrumentation</u>
C1	mmol/l					IL 446 <sup>a</sup>
Male		45	98.84	93.43 - 104.25	2.74	
Female		41	100.61	95.03 - 106.19	2.77	
TCO <sub>2</sub>	mmol/l					IL 446
Male		45	33.53	27.38 - 39.69	9.18	
Female		41	29.80	24.35 - 35.26	9.15	
Calcium	mg/dl					MCA
Male		65	12.07	10.95 - 13.19	4.63	
Female		64	11.85	10.89 - 12.81	4.05	
Phos.	mg/dl					MCA
Male		50	10.09	7.08 - 13.11	14.94	
Female		50	9.07	6.42 - 11.71	14.60	
Tot. Bili.	mg/dl					MCA
Male		70	0.15	0 - 0.39	82.17	
Female		69	0.13	0 - 0.34	82.72	

<sup>a</sup> IL 446 - Chloride/Total CO<sub>2</sub> Analyzer

**TOXICITY RESEARCH LABORATORIES, LTD.**

**TRL Study #032-006**

**Rat Oral Subchronic Toxicity Study**

**Compound:**

**Normal Butanol**

**APPENDIX G**

**Individual Rat Reports  
(Gross and Histopathologic)**

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Male
Rat #	011	No. days on study	93	Found dead	Moribund
Necropsy Date			11/26/85	Prosector	L. Brantman
				Interim	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Left: pit in cortex (observed at trim)	Nephritis, chronic, focal, unilateral, slight
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	<u>I Male</u>
Rat #	<u>012</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>
Necropsy Date				Interim	<u>Final</u>
				Prosector	<u>A. Surge</u>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	<u>I</u>	Male
Rat #	<u>013</u>	No. days on study	<u>93</u>	Found dead	Moribund	Interim
Necropsy Date			<u>11/26/85</u>	Prosector	<u>J. Bozeman</u>	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol Dose Level 0 mg/kg/day Group I Male  
 Rat # 014 No. days on study 92 Found dead Moribund Interim Final   
 Necropsy Date 11/25/85 Prosector A. Surge

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, minimal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Male
Rat #	015	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	A. Surge	Final X

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Cytoplasmic vacuolization, centrilobular, slight
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Proteinaceous material in tubules
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Male
Rat #	016	No. days on study	92	Found dead	Moribund
Necropsy Date	11/25/85			Interim	Final <input checked="" type="checkbox"/>
				Prosector	A. Surge

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	<u>I Male</u>
Rat #	<u>017</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>
Necropsy Date	<u>11/26/85</u>		Prosector	<u>S. Wright</u>	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Nephritis, chronic, focal, slight
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
 RAT ORAL SUBCHRONIC TOXICITY STUDY  
 TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	<u>I</u>	Male
Rat #	<u>018</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>	Interim
Necropsy Date			<u>11/26/85</u>	Prosector	<u>J. Schlicklin</u>	
					Final	<u>X</u>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Section inadequate for diagnosis

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Male
Rat #	019	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	A. Surge	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Male
Rat #	020	No. days on study	92	Found dead	Moribund
Necropsy Date	11/25/85			Interim	Final <input checked="" type="checkbox"/>
				Prosector	J. Schlicklin

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, minimal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	I Male
Rat #	<u>021</u>	No. days on study	<u>92</u>	Found dead	<u>Moribund</u>
Necropsy Date	<u>11/25/85</u>		Prosector	Interim	Final <input checked="" type="checkbox"/>
			J. Schlicklin		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Male
Rat #	022	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	L. Brantman	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Male
Rat #	023	No. days on study	92	Found dead	Moribund
Necropsy Date				Prosector	Interim
				A. Surge	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	No section
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Male
Rat #	024	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	J. Thue	Final

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechiae, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Male
Rat #	025	No. days on study	92	Found dead	Moribund
Necropsy Date				Interim	Final <input checked="" type="checkbox"/>
				Prosector	D. Traxler

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
 RAT ORAL SUBCHRONIC TOXICITY STUDY  
 TRL Study #032-006

Test Material Normal Butanol Dose Level 0 mg/kg/day Group I Male  
 Rat # 026 No. days on study 93 Found dead Moribund Interim Final x  
 Necropsy Date 11/26/85 Prosector L. Brantman

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Male
Rat #	027	No. days on study	93	Found dead	Moribund
Necropsy Date				Interim	Final <input checked="" type="checkbox"/>
				Prosector	D. Traxler

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	I	Male
Rat #	<u>028</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>	Interim
Necropsy Date	<u>11/26/85</u>		Prosector	A. Surge	Final	X

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Male
Rat #	<u>029</u>	No. days on study	<u>93</u>	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	J. Schlicklin	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal
Mandibular Lymph Nodes	Bilateral: red	Lymphadenitis, subacute, diffuse

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Male
Rat #	030	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	S. Wright	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Caudal lobe: small dark area	Agonal hemorrhage
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	041 No.	days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	D. Traxler	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	042	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date	11/25/85		Prosector	D. Traxler		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	043	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	A. Surge	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, slight
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal (1 only)
Parathyroid	Normal	Normal (1 only)
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group I Female
Rat #	044	No. days on study	92	Found dead
Necropsy Date	11/25/85			Moribund
				Interim
				Final X
				Prosector
				J. Schlicklin

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechiae, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Female
Rat #	045	No. days on study	93	Found dead	Moribund
Necropsy Date	11/26/85			Prosector	S. Wright
				Interim	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	046	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	J. Schlicklin	
				Final	<input checked="" type="checkbox"/>	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Agonal hemorrhage
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	047	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	D. Traxler	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.6 cm diameter	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	<u>I</u>	Female
Rat #	<u>048</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>	Interim
Necropsy Date			<u>11/26/85</u>	Prosector	<u>J. Schlicklin</u>	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, minimal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	049	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	A. Surge	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Mineralization - renal pelvis, focal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	No section
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Female
Rat #	050	No. days on study	93	Found dead	Moribund
Necropsy Date	11/26/85			Interim	Final <input checked="" type="checkbox"/>
				Prosector	D. Traxler

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Myositis, subacute, focal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	051	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date				Prosector	J. Schlicklin	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, slight
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	<u>052</u>	No. days on study	<u>92</u>	Found dead	Moribund	Interim
Necropsy Date	<u>11/25/85</u>		Prosector	A. Surge		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	053	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	D. Traxler	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	054	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date	11/25/85			Prosector	L. Brantman	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	<u>I Female</u>
Rat #	<u>055</u>	No. days on study	<u>92</u>	Found dead	<u>Moribund</u>
Necropsy Date	<u>11/25/85</u>		Prosector	J. Thue	Interim
					Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	056	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date	11/26/85		Prosector	D. Traxler		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	057	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	L. Brantman	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I Female
Rat #	058	No. days on study	93	Found dead	Moribund
Necropsy Date	11/26/85			Interim	Final <input checked="" type="checkbox"/>
				Prosector	J. Bozeman

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.5 cm	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>0 mg/kg/day</u>	Group	<u>I Female</u>
Rat #	<u>059</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>
Necropsy Date			<u>11/26/85</u>	Prosector	<u>A. Surge</u>
				Interim	<u>Final</u> <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	0 mg/kg/day	Group	I	Female
Rat #	060	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	J. Schlicklin	

TISSUE	GROSS OBSERVATION		HISTOLOGIC DESCRIPTION	
Heart	Normal		Normal	
Aorta	Normal		Normal	
Thymus	Normal		Normal	
Lung w/bronchi	Normal		Normal	
Trachea	Normal		Normal	
Esophagus	Normal		Normal	
Stomach-forestomach	Normal		Normal	
Stomach-cardiac	Normal		Normal	
Stomach-fundic	Normal		Normal	
Stomach-pyloric	Normal		Normal	
Salivary Gland-sublingual	Normal		Normal	
Salivary Gland-mandibular	Normal		Normal	
Duodenum	Normal		Normal	
Jejunum	Normal		Normal	
Ileum	Normal		Normal	
Colon	Normal		Normal	
Liver	Normal		Normal	
Pancreas	Normal		Normal	
Spleen	Normal		Normal	
Mesenteric Lymph Node	Normal		Normal	
Kidney	Normal		Normal	
Urinary Bladder	Normal		Normal	
Adrenal	Normal		Normal	
Pituitary	Normal		Normal	
Eye	Normal		Synechia, posterior	
Optic Nerve	Normal		Normal	
Thyroid	Normal		Normal	
Parathyroid	Normal		Normal	
Spinal Cord-thoracic	Normal		Normal	
Spinal Cord-lumbar	Normal		Normal	
Brain-fore	Normal		Normal	
Brain-mid	Normal		Normal	
Brain-hind	Normal		Normal	
Femur with marrow	Normal		Normal	
Ovary	Normal		Normal	
Uterine horn	Normal		Normal	
Cervix	Normal		Normal	
Skin	Normal		Normal	
Mammary Gland	Normal		Normal	
Skeletal Muscle	Normal		Normal	
Sciatic Nerve	Normal		Normal	

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol Dose Level 30 mg/kg/day Group II Males  
No. days on study 92 or 93 Necropsy Date 11/25-26/85 Interim Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
071	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
072	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
073	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
074	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Lung	Caudal lobe: dark spot	Agonal hemorrhage
075	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Lung	All lobes: white areas on edges	Histologically normal
076	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
077	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Mandibular Lymph Node	Left: enlarged	Lymphadenitis, subacute, diffus
078	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Mandibular Lymph Node	Left: enlarged	Lymphadenitis, subacute, diffus
079	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
080	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol Dose Level 30 mg/kg/day Group II Males  
No. days on study 92 or 93 Necropsy Date 11/25-26/85 Interim Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
081	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
082	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
083	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
084	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
085	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Mandibular Lymph Nodes	Bilateral: enlarged	Lymphadenitis, subacute, diffu
086	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
087	Heart	Normal	Normal
	Liver	Normal	Hepatitis, subacute, focal, minimal
	Kidney	Normal	Nephritis, chronic, focal, minimal
088	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
089	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
090	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol      Dose Level 30 mg/kg/day      Group II Females  
 No. days on study 92 or 93      Necropsy Date 11/25-26/85      Interim       Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
101	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
102	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
103	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
104	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
105	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
106	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
107	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
108	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
109	Heart	Normal	Normal
	Liver	Normal	Hepatitis, subacute, focal, sl.
	Kidney	Normal	Normal
110	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
111	Heart	Normal	Normal
	Liver	Normal	Hepatitis, subacute, focal, minimal
	Kidney	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol      Dose Level 30 mg/kg/day      Group II Female  
 No. days on study 92 or 93    Necropsy Date 11/25-26/85    Interim    Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
112	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Mesentery	Red and congested	Thrombus
113	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
114	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Nephritis, chronic, focal, minimal
115	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
116	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
117	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Uterine Horns	Both: enlarged up to 0.6 cm diameter	Hydrometra, bilateral
118	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Uterine Horns	Both: enlarged up to 0.5 cm diameter	Hydrometra, bilateral
119	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Nephritis, chronic, focal, sli
120	Heart	Normal	Normal
	Liver	Normal	Hepatitis, chronic, focal, sli
	Kidney	Normal	Nephritis, subacute, focal, minimal
	Uterine Horns	Both: enlarged up to 0.5 cm; fluid-filled	Hydrometra, bilateral

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol      Dose Level 125 mg/kg/day      Group III Males  
 No. days on study 92 or 93 Necropsy Date 11/25-26/85 Interim Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
131	Heart	Normal	Myelitis, subacute, focal, minimal
	Liver	Normal	Normal
	Kidney	Normal	Normal
132	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
134	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Nephritis, chronic, focal, sli
	Mandibular Lymph Node	Left: enlarged	Lymphadenitis, subacute, diffu
135	Heart	Normal	Normal
	Liver	Normal	Hepatitis, subacute, focal, minimal
	Kidney	Normal	Normal
136	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
137	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
138	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Nephritis, chronic, focal, minimal
139	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
140	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
141	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol      Dose Level 125 mg/kg/day      Group III Males  
 No. days on study 92 or 93 Necropsy Date 11/25-26/85 Interim Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
142	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Mandibular Lymph Node	Left: enlarged	Lymphadenitis, subacute, diffus
143	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
144	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
145	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
146	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
147	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
148	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
149	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
150	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>125 mg/kg/day</u>	Group	<u>III</u>	Male
Rat #	<u>133</u>	No. days on study	<u>6</u>	Found dead	<u>x</u>	Moribund
Necropsy Date	<u>8/31/85</u>			Interim		Final
				Prosector	<u>S. Wright</u>	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Pericarditis, acute, diffuse
Aorta	Normal	Normal
Thymus	Normal	Lymphocytolysis
Lung w/bronchi	Left lobe: red; Cranial and middle lobes: shriveled	Pleuritis, acute, focal; Edema; Collapse
Trachea	Normal	Normal
Esophagus	Normal	Perforation; Inflammation, acute, focal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Autolysis
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Lymphadenitis, chronic, diffuse
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Autolysis
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

Cause of death: gavaging accident

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol Dose Level 125 mg/kg/day Group III Female  
No. days on study 92 or 93 Necropsy Date 11/25-26/85 Interim Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
161	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
162	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	uterine Horns	Both: enlarged up to 0.5 cm diameter	Hydrometra, bilateral
163	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
164	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
165	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
166	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
167	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
168	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
169	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
170	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material Normal Butanol      Dose Level 125 mg/kg/day      Group III Females  
 No. days on study 92 or 93 Necropsy Date 11/25-26/85 Interim  Final X

RAT #	TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
171	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
172	Heart	Normal	Normal
	Liver	Right lobe: small extra lobe attached to right lobe	Histologically normal
	Kidney	Normal	Normal
173	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Uterine Horns	Both: enlarged up to 0.5 cm diameter	Hydrometra, bilateral
174	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Uterine Horns	Both: enlarged up to 0.6 cm	Hydrometra, bilateral
175	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
176	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
177	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
	Uterine Horns	Both: dilated to 0.6 cm	Hydrometra, bilateral
178	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
179	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal
180	Heart	Normal	Normal
	Liver	Normal	Normal
	Kidney	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Male
Rat #	<u>191</u>	No. days on study	<u>93</u>	Found dead	Moribund	Interim
Necropsy Date			<u>11/25/85</u>	Prosector	<u>J. Schlicklin</u>	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Male
Rat #	192	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	L. Brantman	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Pouch	Histologically normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, minimal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal
Mandibular Lymph Nodes	Bilateral: enlarged	Lymphadenitis, subacute, diffu

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Male
Rat #	193	No. days on study	93	Found dead	Moribund
Necropsy Date				Prosector	Interim
					Final X
				S. Wright	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV</u>	Male
Rat #	<u>194</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>	Interim
Necropsy Date	<u>11/26/85</u>		Prosector	<u>L. Brantman</u>		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Pleuritis, chronic, focal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Right lobe: adhered to right kidney	Histologically normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Right: adhered to right lobe of liver; Lesion broken at necropsy	Nephritis, chronic, focal, slight
Urinary Bladder	Normal	Cystitis, chronic, diffuse, sli
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	No section
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV Male</u>
Rat #	<u>195</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>
Necropsy Date			<u>11/26/85</u>	Interim	<u>Final</u>
				Prosector	<u>J. Bozeman</u>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV Male</u>
Rat #	<u>196</u>	No. days on study	<u>92</u>	Found dead	<u>Moribund</u>
Necropsy Date			<u>11/25/85</u>	Interim	<u>Final</u>
				Prosector	<u>J. Schlicklin</u>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Male
Rat # 197	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date		11/25/85	Prosector	Final X	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	No section
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal
Mandibular Lymph Nodes	Bilateral: enlarged	Lymphadenitis, subacute, diffuse

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Male
Rat #	198	No. days on study	92	Found dead	Moribund
Necropsy Date				Interim	Final <input checked="" type="checkbox"/>
				Prosector	D. Traxler

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Male
Rat # 199	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date		11/26/85	Prosector	S. Wright	Final X

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Male
Rat #	200	No. days on study	92	Found dead	Moribund
Necropsy Date				Interim	Final <input checked="" type="checkbox"/>
				Prosector	D. Traxler

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Male
Rat #	201	No. days on study	92	Found dead	Moribund
Necropsy Date				Interim	Final X
				Prosector	D. Traxler

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV Male</u>
Rat #	<u>202</u>	No. days on study	<u>46</u>	Found dead	<u>Moribund X</u>
Necropsy Date	<u>10/10/85</u>		Prosector	<u>S. Wright</u>	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Necrosis, focal
Aorta	Normal	Normal
Thymus	Normal	Lymphocytolysis
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Rubber catheter tube lodged in esophagus	Myositis, subacute, focal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Glandular mucosa: dark area	Necrosis, focal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Hypophyseal cleft - contains excess colloid
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

Cause of death: dosing trauma

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Male
Rat # 203	No. days on study	92	Found dead	Moribund	Interim	Final
Necropsy Date		11/25/85	Prosector	A. Surge		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, minimal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Male
Rat # 204	No. days on study	92	Found dead	Moribund	Interim	Final X
Necropsy Date		11/25/85	Prosector	L. Brantman		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV</u>	Male
Rat #	<u>205</u>	No. days on study	<u>92</u>	Found dead	<u>Moribund</u>	Interim
Necropsy Date	<u>11/25/85</u>		Prosector	<u>J. Thue</u>		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Male
Rat #	206	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date	11/25/85	Prosector	J. Schlicklin	Final	X	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechiae, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Male
Rat # 207	No. days on study	93	Found dead	Moribund	Interim	Final X
Necropsy Date	11/26/85		Prosector	J. Bozeman		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV</u>	Male
Rat #	<u>208</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>	Interim
Necropsy Date	<u>11/26/85</u>		Prosector	<u>J. Schlicklin</u>		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Male
Rat #	209	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date	11/26/85			Prosector	D. Traxler	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Degeneration, focal
Sciatic Nerve	Normal	Normal
Mandibular Lymph Nodes	Left: enlarged	Lymphadenitis, subacute, diffus.

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Male
Rat # 210	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date	11/26/85		Prosector	J. Bozeman	Final <u>X</u>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Testis	Normal	Normal
Epididymis	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal
Mandibular Lymph Node	Left: enlarged	Lymphadenitis, subacute, diffuse

TOXICITY RESEARCH LABORATORIES, LTD.  
 RAT ORAL SUBCHRONIC TOXICITY STUDY  
 TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV Female</u>
Rat #	<u>221</u>	No. days on study	<u>93</u>	Found dead	<u>Moribund</u>
Necropsy Date	<u>11/26/85</u>		Prosector	<u>D. Traxler</u>	Interim      Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	222	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date	11/25/85	Prosector		D. Traxler		Final X

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.7 cm diameter	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	223	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	S. Wright	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Hepatitis, subacute, focal, slight
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.5 cm diameter, fluid-filled	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Female
Rat # 224	No. days on study	28	Found dead	X Moribund	Interim Final
Necropsy Date		9/22/85	Prosector	S. Wright	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Agonal hemorrhage
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Hypophyseal cleft - contains excess colloid
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

Cause of death: not ascertained

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat # 225	No. days on study	92	Found dead	Moribund	Interim	Final X
Necropsy Date		11/25/85	Prosector	J. Bozeman		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.5 cm	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	226	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	J. Bozeman	Final <u>X</u>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	227	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	A. Surge	Final X

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
 RAT ORAL SUBCHRONIC TOXICITY STUDY  
 TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV Female
Rat #	228	No. days on study	92	Found dead	Moribund
Necropsy Date	11/25/85			Interim	Final <input checked="" type="checkbox"/>
				Prosector	L. Brantman

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
 RAT ORAL SUBCHRONIC TOXICITY STUDY  
 TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	229	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date	11/26/85	Prosector	J. Bozeman	Final		<input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	230	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date	11/26/85		Prosector	D. Traxler		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
 RAT ORAL SUBCHRONIC TOXICITY STUDY  
 TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat # 231	No. days on study	92	Found dead	Moribund	Interim	Final <input checked="" type="checkbox"/>
Necropsy Date		11/25/85	Prosector	A. Surge		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	232	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	F. Snell	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	233	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date			11/25/85	Prosector	J. Bozeman	

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechiae, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.5 cm	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	234	No. days on study	92	Found dead	Moribund	Interim
Necropsy Date	11/25/85			Prosector	D. Traxler	Final X

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Hypophyseal cleft - contains excess colloid
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.8 cm diameter	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
 RAT ORAL SUBCHRONIC TOXICITY STUDY  
 TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat # 235	No. days on study	92	Found dead	Moribund	Interim	Final <input checked="" type="checkbox"/>
Necropsy Date			Prosector	A. Surge		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.5 cm diameter	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	<u>Normal Butanol</u>	Dose Level	<u>500 mg/kg/day</u>	Group	<u>IV</u>	Female
Rat #	<u>236</u>	No. days on study	<u>92</u>	Found dead	<u>Moribund</u>	Interim
Necropsy Date	<u>11/25/85</u>		Prosector	<u>L. Brantman</u>		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat # 237	No. days on study	93	Found dead	Moribund	Interim	Final X
Necropsy Date	11/26/85		Prosector	L. Brantman		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	238	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date			11/26/85	Prosector	A. Surge	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Middle lobe: dark spot	Agonal hemorrhage
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	239	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date	11/26/85			Prosector	S. Wright	Final <input checked="" type="checkbox"/>

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Normal
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Both: enlarged up to 0.7 cm; fluid-filled	Hydrometra, bilateral
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

TOXICITY RESEARCH LABORATORIES, LTD.  
RAT ORAL SUBCHRONIC TOXICITY STUDY  
TRL Study #032-006

Test Material	Normal Butanol	Dose Level	500 mg/kg/day	Group	IV	Female
Rat #	240	No. days on study	93	Found dead	Moribund	Interim
Necropsy Date	11/26/85		Prosector	J. Schlicklin		

TISSUE	GROSS OBSERVATION	HISTOLOGIC DESCRIPTION
Heart	Normal	Normal
Aorta	Normal	Normal
Thymus	Normal	Normal
Lung w/bronchi	Normal	Normal
Trachea	Normal	Normal
Esophagus	Normal	Normal
Stomach-forestomach	Normal	Normal
Stomach-cardiac	Normal	Normal
Stomach-fundic	Normal	Normal
Stomach-pyloric	Normal	Normal
Salivary Gland-sublingual	Normal	Normal
Salivary Gland-mandibular	Normal	Normal
Duodenum	Normal	Normal
Jejunum	Normal	Normal
Ileum	Normal	Normal
Colon	Normal	Normal
Liver	Normal	Normal
Pancreas	Normal	Normal
Spleen	Normal	Normal
Mesenteric Lymph Node	Normal	Normal
Kidney	Normal	Normal
Urinary Bladder	Normal	Normal
Adrenal	Normal	Normal
Pituitary	Normal	Normal
Eye	Normal	Synechia, posterior
Optic Nerve	Normal	Normal
Thyroid	Normal	Normal
Parathyroid	Normal	Normal
Spinal Cord-thoracic	Normal	Normal
Spinal Cord-lumbar	Normal	Normal
Brain-fore	Normal	Normal
Brain-mid	Normal	Normal
Brain-hind	Normal	Normal
Femur with marrow	Normal	Normal
Ovary	Normal	Normal
Uterine horn	Normal	Normal
Cervix	Normal	Normal
Skin	Normal	Normal
Mammary Gland	Normal	Normal
Skeletal Muscle	Normal	Normal
Sciatic Nerve	Normal	Normal

**TOXICITY RESEARCH LABORATORIES, LTD.**

**TRL Study #032-006**

**Rat Oral Subchronic Toxicity Study**

**Compound:**

**Normal Butanol**

**APPENDIX H**

**Histoaccountability Report**

Table H-II  
 Toxicity Research Laboratories, Ltd.  
 Histoaccountability for 13 Week Rat Oral Subchronic Toxicity Study of Normal Butanol

<u>Tissue</u>	<u>A</u>	<u>B</u>	<u>Tissue</u>	<u>A</u>	<u>B</u>
Heart	0	100.0	Spinal cord - thoracic	0	100.0
Aorta	0	100.0	Brain-cerebrum	0	100.0
Thymus	0	100.0	Brain-midbrain	0	100.0
Lung w/bronchi	0	100.0	Brain-cerebellum	0	100.0
Trachea	0	100.0	Skin	0	100.0
Esophagus	0	100.0	Mammary gland	2	97.5
Stomach - forestomach	0	100.0	Skeletal muscle	0	100.0
Stomach - cardiac	0	100.0	Nerve	0	100.0
Stomach - fundic	0	100.0	Eye	0	100.0
Stomach - pyloric	0	100.0	Optic Nerve	0	100.0
Jejunum	0	100.0	Femur (marrow)	0	100.0
Duodenum	0	100.0	Thyroid	0	100.0
Ileum	0	100.0	Parathyroid	1	98.8
Colon	0	100.0	Urinary bladder	0	100.0
Salivary gland - sublingual	0	100.0	Testis	0	100.0
Salivary gland - mandibular	0	100.0	Epididymis	0	100.0
Mesenteric lymph node	0	100.0	Ovary	0	100.0
Liver	0	100.0	Uterine horn	0	100.0
Spleen	0	100.0	Cervix	0	100.0
Pancreas	0	100.0	Mandibular lymph node	0	100.0
Kidney	0	100.0	Masses/lesions	0	100.0
Adrenal	0	100.0			
Pituitary	1	98.8			
Spinal cord - lumbar	0	100.0			

Column A: Number of rats for which no section of the indicated tissue was found.

Column B: Percentage of rats examined in which a section of the indicated tissue was found.

## PROTOCOL

TRL STUDY #032-006

Conducted for:

RESEARCH TRIANGLE INSTITUTE  
P.O. Box 12194  
Research Triangle Park, North Carolina 27709

by:

TOXICITY RESEARCH LABORATORIES, LTD.  
510 West Hackley Avenue  
Muskegon, Michigan 49444

Type of Study to be Conducted:

Rat Oral Subchronic Toxicity Study

Compound:

Normal Butanol

Objective

To evaluate the toxicity of Normal Butanol in a Rat Subchronic Toxicity Study.

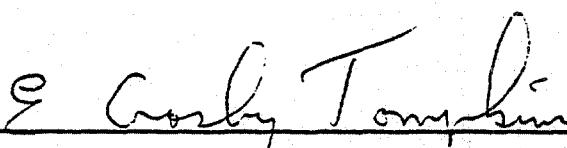
Start of Test: August 19, 1985

First Day of Dosing: August 26, 1985

Interim Necropsy: September 23 and 24, 1985

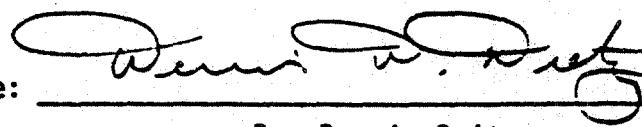
Final Necropsy: November 25 and 26, 1985

Study Director:

  
E. Crosby Tompkins, Ph.D.  
Diplomate, American Board of Toxicology

8-7-85

Date

Sponsor  
Representative:  
Dr. Dennis Deitz

8-20-85

Date

**A. General**

The rat was chosen as a test system because of its established usefulness in toxicologic studies and as a pharmacologic model. The oral route of administration was chosen because this will be the probable route of human exposure.

**B. Test Material**

Normal Butanol

**C. General Procedure**

Approximately 140 male and 140 female weaning CD rats (45-55 grams) supplied by Charles River Breeding Labs, Portage, Michigan, will be housed<sup>a</sup> in wire mesh cages and fed Purina Certified Rodent Chow and tap water ad libitum. Water will be provided via an automatic watering system. During a pretest period of approximately 7 to 10 days, the animals will be observed with respect to general health and any clinical signs of disease. All rats with any evidence of disease or physical abnormalities will be discarded.

At the end of the conditioning period the rats selected for study will be randomly assigned to groups. Minor reassessments will be done if required to assure similar group mean body weights.

Groups	Number of Animals				Dosage Level (mg/kg/day)
	Male		Female		
	Interim Sac	Final Sac	Interim Sac	Final Sac	
I	1-10	11-30	31-40	41-60	Control
II	61-70	71-90	91-100	101-120	
III	121-130	131-150	151-160	161-180	
IV	181-190	191-210	211-220	221-240	
V	241-250 <sup>c</sup>		251-260 <sup>c</sup>		

<sup>a</sup> Animals will be housed in accordance with recommendations contained in DHEW Publication No. 78-23 (NIH): Revised 1978, "Guide for the Care and Use of Laboratory Animals."

<sup>b</sup> There is no reason to believe that contaminants would be present in the feed at concentrations that would affect the study.

<sup>c</sup> Group V rats will be used for a baseline clinical pathologic evaluation only.

Each rat will be identified by toe clipping. The animals will be individually housed in a temperature ( $72 \pm 3 F^\circ$ ) and humidity ( $50\% \pm 20$ ) controlled room with controlled light cycles (12 hours on and 12 hours off). The test material will be diluted with water and administered orally via a ball tip metal dosing cannula at a dosing volume of 10 ml/kg. Control rats will receive water in a similar manner. The amount of solution administered will be based on the most recent body weight of each rat. The rats will be dosed daily until the day of necropsy. Study duration will be 13 weeks. Dosing solution will be prepared weekly. Samples of each dose concentration will be saved for analysis during weeks 1 and 13, and at three other randomly chosen study weeks.

D. Observations

All animals will be observed for mortality and overt signs of toxicity at least twice a day 7 days a week. Should mortality or such overt signs of toxicity be observed, these will be recorded on the day observed. Individual body weights and individual food consumption will be recorded weekly.

E. Ophthalmoscopic Examination

During the pretreatment period and week 13, all rats will be subjected to funduscopic (indirect ophthalmoscopic) examinations. Biomicroscopic (slit lamp) examinations will be done at the discretion of the ophthalmologist, study director, and sponsor.

F. Clinical Laboratory Studies

The clinical laboratory tests described below will be conducted on all Group V rats prior to initiation of dosing, on all surviving rats scheduled for the interim sacrifice and on the first 10 (numerically) surviving males and first 10 surviving females from each group at the final sacrifice. Blood will be obtained from the posterior vena cava via cardiac puncture. Urine will be collected in metabolism cages.

Hematology

Hemoglobin

Mean corpuscular hemoglobin

Mean corpuscular hemoglobin concentration

Mean corpuscular volume

Hematocrit value

Erythrocyte count

Leucocyte count (total and differential)

Reticulocyte count (samples taken counted only if indicated by signs of anemia; additional cost)

Platelet count

Blood Chemistry

Serum alkaline phosphatase  
SGPT  
SGOT  
Glucose  
Urea nitrogen  
Total serum protein  
Serum albumin  
Serum electrolytes ( $\text{Na}^+$ ,  $\text{K}^+$ , and  $\text{Cl}^-$ )  
Total serum bilirubin  
Total serum cholesterol  
A/G ratio  
Globulin (by calculation)  
 $\text{TCO}_2$

Urine

Specific gravity  
pH  
Protein  
Glucose  
Ketones  
Bilirubin  
Urobilinogen  
Microscopic examination

Due to the limited amount of blood in the young rats, platelets will be estimated (rather than counted on the Group V rats). Cl and  $\text{TCO}_2$  evaluations will be done on the Group V rats only if enough blood is collected.

F. Pathology

Necropsies will be performed on all animals including those which succumb during the course of the study or are sacrificed in extremis. Eyes from each rat necropsied at the prescribed interval will be fixed in a modified Zenker fixative. Testes and epididymides of all rats will be fixed in Bouin's fixative. All other tissues will be preserved in 10% neutral buffered formalin. Tissues will be taken from all animals regardless of autolytic state. The surviving rats will be sacrificed with  $\text{CO}_2$  after four or thirteen weeks of study. Organs will be weighed for all rats at the four and thirteen week sacrifices. They will not be weighed for animals found dead or sacrificed in extremis. Prior to fixation, the following organs will be weighed: brain, heart, liver, spleen, kidneys, testes with epididymides, and ovaries. Organ to body weight ratio will be computed.

Microscopic examination of hematoxylin and eosin stained paraffin sections will be performed on the following:

- a) Animals dying on study or sacrificed in extremis.
- b) All rats from the control and high-dose groups.
- c) Tissues with gross lesions.
- d) Livers, hearts, kidneys, and target organs (if determined from previous studies) from all low- and mid-dose group rats.

The following tissues will be fixed and preserved for all animals and examined histologically for those animals described above:

Adrenals	Ovaries
Aorta	Pancreas
Bone with marrow - femur	Pituitary gland
Brain (3 levels)	Salivary glands (Sublingual, mandibular)
Cervix	Spleen
Colon	Stomach (sections of fore- stomach, cardiac, fundic, and pyloric regions)
Duodenum	Testes with epididymides
Esophagus	Thymus
Eyes with optic nerves	Thyroids with parathyroids
Heart	Trachea
Ileum	Uterine horns
Jejunum	Urinary bladder
Kidney	Any other tissue(s) with gross lesions
Liver (two sections)	
*Lung with bronchi	
Mesenteric lymph node	

\*Lungs will be inflated with formalin via the trachea (except for those animals found dead).

With the exception of the thyroids (with parathyroids), only one member of an organ pair will be examined. However, if a treatment-related lesion is observed in one member of the pair the pathologist, study director and sponsor will decide if the other member of the pair should be examined.

If histologic examination of a dose group detects treatment-related lesions in a tissue, this tissue will be evaluated on all animals of that sex from the next lower dosage level.

#### H. Statistics

The data will be tested for homogeneity of variance by Bartlett's<sup>a</sup> method. If the data are found to be homogeneous, differences between control and treatment means will be tested for statistical significance by the method of Dunnett.<sup>b</sup> If the data are found not to be homogeneous, the method of Gill<sup>c</sup> (modified Dunnett's) will be employed.

---

<sup>a</sup> Snedecor, G.W., and Cochran, Statistical Methods, 6th ed., Iowa State Univ. Pres. Amer., 1967.

<sup>b</sup> Dunnett, C.W.: Biometrics, 1964, 20:482-491.

<sup>c</sup> Gill, J.L.: Journal of Dairy Science, 1977, 60:444-449.

I. Personnel Responsibilities

Toxicologist:	Randall Reed, B.A.
Study Director:	E. Crosby Tompkins, Ph.D.
Director of Toxicology:	E. Crosby Tompkins, Ph.D.
Director of Pathology:	B.J. Payne, D.V.M., M.S., Ph.D.
Pathologist:	Nabeel Mehdi, B.V.M.S., Ph.D.
Quality Assurance Officer:	Susan Griesbach, B.S.
Ophthalmologist:	W.F. Keller, D.V.M., M.S. (Consultant)

J. Personnel Health and Safety

Personnel working in the compound preparation and animal room will wear clean uniforms, safety glasses, disposable gloves, face mask, hair covers, and boots. In addition, respirators will be worn in compound preparation and while dosing the animals.

K. Data Retention

All data, including slides, blocks and wet tissues will be retained at TRL for at least five years. If at some time in the future any of these data are to be discarded, the sponsor will first be notified to obtain permission.

L. Reports

A draft final report will be prepared and submitted to the Sponsor within 4 weeks following the completion of the interim sacrifice, and within 3 months of the final sacrifice. The report shall include the experimental design, effects on body weight, food consumption, general physical appearance and behavior, pharmacotoxic signs, organ weights, clinical laboratory tests, ophthalmoscopic findings, gross and microscopic pathological findings.

M. Alteration of Design

Alterations of this protocol may be made as the study progresses. No changes in the protocol will be made without the specific written request or verbal consent of the sponsor. In the event the sponsor authorizes a protocol change verbally, such changes will be honored by TRL. However, it then becomes the responsibility of TRL to follow such verbal change with a written verification.

TRL No. 032-006  
Protocol Change No. 1  
Authorized By: Dr. Dennis Deitz  
Letter  Phone  Visit   
Effective Date: August 15, 1985

TOXICITY RESEARCH LABORATORIES, LTD.  
510 WEST HACKLEY AVENUE  
MUSKEGON, MICHIGAN 49444

Protocol Amendment

Study Title: Rat Oral Subchronic Toxicity Study with Normal Butanol

Change to be Made:

- 1) Mammary gland, skin muscle and nerve will be added to the list of tissues to be evaluated histologically.
- 2) Serum calcium and inorganic phosphate will be measured at the 4 and 13 week clinical pathologic evaluation if enough serum is available.

Rationale for Change:

- 1) This will give a more thorough toxicologic evaluation of the test material.
- 2) This will give a more thorough toxicologic evaluation of the test material.

E. Arlene Tomlin  
Study Director

8-17-85  
Date

Dennis D. Deitz  
Sponsor Representative

9/4/85  
Date

Distribution: Distribute to all recipients of original protocol.

I-8

TRL No. 032-006

Addendum No. 1

Authorized By: Dr. Dennis Deitz

Letter  Phone  Visit

Effective Date: August 19, 1985

TOXICITY RESEARCH LABORATORIES, LTD.

510 WEST HACKLEY AVENUE  
MUSKEGON, MICHIGAN 49444

Protocol Addendum

Study Title: Rat Oral Subchronic Toxicity Study with Normal Butanol

Addendum to be made:

Dose Levels will be 0, 30, 125, and 500 mg/kg/day.

E. Curtis Tappin

8-23-85

Study  
Director

Date

Distribution: Distribute to all recipients of original protocol.

I-9

TRL No. 032-006

Protocol Change No. 2

Authorized By: Dr. Dennis Deitz

Letter  Phone  Visit

Effective Date: August 19, 1985

TOXICITY RESEARCH LABORATORIES, LTD.

510 WEST HACKLEY AVENUE

MUSKEGON, MICHIGAN 49444

Protocol Amendment

Study Title: Rat Oral Subchronic Toxicity Study

with Normal Butanol

Change to be Made:

- 1) Serum calcium and phosphorus will be analyzed at the pretreatment clinical pathologic evaluation.

Rationale for Change:

- 1) Enough serum was available for the determination.

E. Andy Tengblad

8-30-85

Dennis A. Deitz

9/17/85

Study Director

Date

Sponsor Representative

Date

Distribution: Distribute to all recipients of original protocol.

TRL No. 032-006

Protocol Change No. 3

Authorized By: Dr. Dennis Deitz

Letter  Phone  Visit 

Effective Date: September 3, 1985

TOXICITY RESEARCH LABORATORIES, LTD.  
510 WEST HACKLEY AVENUE  
MUSKEGON, MICHIGAN 49444

Protocol Amendment

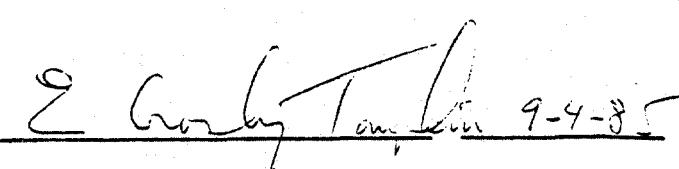
Study Title: Rat Oral Subchronic Toxicity Study  
with Normal Butanol

Change to be Made:

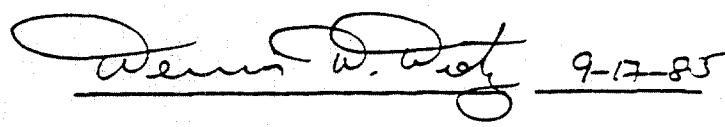
- 1) At the interim sacrifice, tissues will be preserved as described. However, a histologic evaluation will only be conducted on those in which there is a suggestion of a treatment-related effect upon gross examination. At the completion of the study a decision will be made concerning which, if any of these tissues from the interim sacrifice will be examined histologically. There will be an additional charge for tissues evaluated from the interim sacrifice. A formal report will not be prepared at the interim sacrifice. However, all available data will be summarized and mailed to the Research Triangle Institute in the form of a study update.

Rationale for Change:

- 1) Done at the request of the Research Triangle Institute.



E. Anthony Toman 9-4-85



Dennis D. Deitz 9-17-85

Study Director

Date

Sponsor Representative

Date

Distribution: Distribute to all recipients of original protocol.

I-11

TRL No. 032-006

Protocol Change No. 4

Authorized By: Dr. Dennis Deitz

Letter  Phone  Visit

Effective Date: September 10, 1985

TOXICITY RESEARCH LABORATORIES, LTD.  
510 WEST HACKLEY AVENUE  
MUSKEGON, MICHIGAN 49444

Protocol Amendment

Study Title: Rat Oral Subchronic Toxicity Study with Normal Butanol

Change to be Made:

- 1) Serum creatinine levels will be obtained at the interim and final clinical pathologic evaluation.
- 2) The pathology section is section G not F.
- 3) Two levels of spinal cord (thoracic and lumbar) will be added to the list of tissues to be saved at the interim sacrifice and saved and evaluated histologically at the final sacrifice.
- 4) Organ weights will not be taken at the interim sacrifice.
- 5) The interim sacrifice will be during week 6 (days 43 and 44) rather than during week 4 (days 29 and 30).
- 6) Adrenals and thyroids with parathyroids will be weighed after fixation at the final sacrifice.

Rationale for Change:

- 1) Done at the request of Research Triangle Institute.
- 2) correcting a typographical error
- 3) Done at the request of Research Triangle Institute.
- 4) This sacrifice is primarily to obtain blood for the clinical pathologic evaluation.
- 5) Done at the request of Research Triangle Institute.
- 6) Done at the request of Research Triangle Institute.

E. Andy Tomlin

9-13-85

Dennis W. Deitz

10/24/85

Study Director

Date

Sponsor Representative

Date

Distribution: Distribute to all recipients of original protocol.

I-12

TRL No. 032-006

Protocol Amendment No. 5

Authorized by: Dr. Dennis Dietz

Letter        Phone X Visit       

Effective Date: November 27, 1985

TOXICITY RESEARCH LABORATORIES, LTD.  
510 WEST HACKLEY AVENUE  
MUSKEGON, MICHIGAN 49444

Protocol Amendment

Study Title: Rat Oral Subchronic Toxicity Study with Normal Butanol

Change to be Made:

1. B.J. Payne, D.V.M., M.S., Ph.D. will perform the histopathologic evaluation of the tissues.

Rationale for Change:

1. To better adjust the workload at TRL.

Andy Tomlin

Study Director

1-10-86

Date

Dennis Dietz

Sponsor Representative

1/27/86

Date

Distribution: Distribute to all recipients of original protocol.

TOXICITY RESEARCH LABORATORIES, LTD.

TRL Study #032-006

Rat Oral Subchronic Toxicity Study

Compound:

Normal Butanol

APPENDIX J

QAU Statement

TRL NO.: 032-006

TOXICITY RESEARCH LABORATORIES, LTD.  
510 West Hackley Avenue  
Muskegon, Michigan 49444

## FINAL REPORT--QAU STATEMENT

Study Title: Rat Oral Subchronic Toxicity Study of Normal Butanol

## QAU Inspections:

<u>Date Performed</u>	<u>Date Reported*</u>
August 22, 1985	August 23, 1985
August 23, 1985	August 26, 1985
October 7-8, 1985	October 9, 1985
October 17, 1985	October 17, 1985
October 28, 1985	October 28, 1985
November 11, 1985	November 12, 1985
November 25-26, 1985	November 28, 1985

Final Report QAU Audit Completed: October 28, 1987Susan Sullivan (by R.H.)QAU Supervisor  
Susan Sullivan, B.S.October 28, 1987

Date

\* To TRL Management and Study Director

TRL QAU Form 5, 6/79